THE WEEHAWKEN TUNNEL.

The New York, West Shore & Buffalo Railway commences at Weehawken, New Jersey, passes through the hills, turning to the north, keeping along the line of the Hudson River, striking Haverstraw, West Point, Newburgh, Kingston, and at Coeymans Junction, dividing, the main line going to Buffalo, and the branch to Albany. The hills upon the west side of the Hudson commence in a small ridge opposite New York bay and extend in a northerly direction along the bank of the river and at varying distances from it. All the railroad lines reaching New York City through New Jersey have found a formidable barrier in this ridge, and when the height prevented an open cut, have been obliged to resort to tunneling.

During the early part of this week we visited the tunnel at Weehawken, now being built by the above-mentioned company, under contract with Messrs. Smith, Ripley & Coleman, and under the guidance of the Superintendent, Mr. J. P. Stanton, thoroughly inspected the work. Extensive dock facilities, designed for the accommodation of both passenger and freight traffic, are now being constructed at the river end. There will be twelve piers of ample size to permit of the easy handling of freight, separated one from the other by deep water slips. Tracks lead from the tunnel to each of the piers. South of these is the passenger station and ferry, one line from which will land at the foot of Forty-second street, and another line will go down town to a point not yet determined. Just south of the station a round-house will be located. Such additional tracks and shops as may be necessary will be placed on the meadows at the New Durham end of the tunnel.

The profile (Fig. 1) shows the contour of the hill and the positions of the portals and of the shafts. Work was begun just fifteen months ago and five shafts have been sunk from the top of the hill to the grade line of the tunnel. From the foot of these shafts work has been pushed in both directions, with the exception of No. 5, in which, owing to its location, progress is only made in an easterly course.

These shafts were sunk the following depths :

No. 1 east portal	140 ft.
" 2	145 "
" 3	160 "
" 4	140 "
" 5	88 "

The cross-section measurements are 8 by 16 ft.

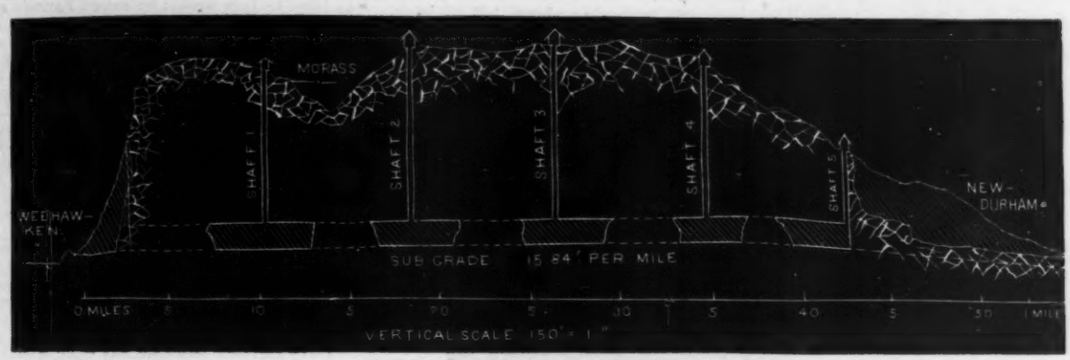

FIG. 1.—PROFILE SHOWING COMPLETED SECTIONS.

Descending shaft No. 1, we visited the eastern heading to examine the method of excavating. Five Rand drills were at work rapidly opening a receptacle for a dose of high explosive, whose pent-up forces were to be liberated by the agency of electricity. All the men leave the tunnel when a charge is to be exploded, returning after things have quieted down. The loose material is placed upon cars running upon two tracks, which are laid as rapidly as the heading advances, and pushed to the bottom of the shaft. The hoisting machinery consists of a Copeland and Bacon engine located in a little shed at the mouth. Two wire cables extend from the drum of the engine to two platforms, so placed in regard to the ropes that one is descending while the other is ascending. The loaded car is run upon one of these, raised to the surface, where it is taken by a locomotive to the place assigned for its load. To relieve the work of water a Worthington pump is placed at the foot of each shaft and is supplied with steam by the boilers at the mouth.

Air for the drills is furnished by five Rand compressors placed at the eastern side of the work.

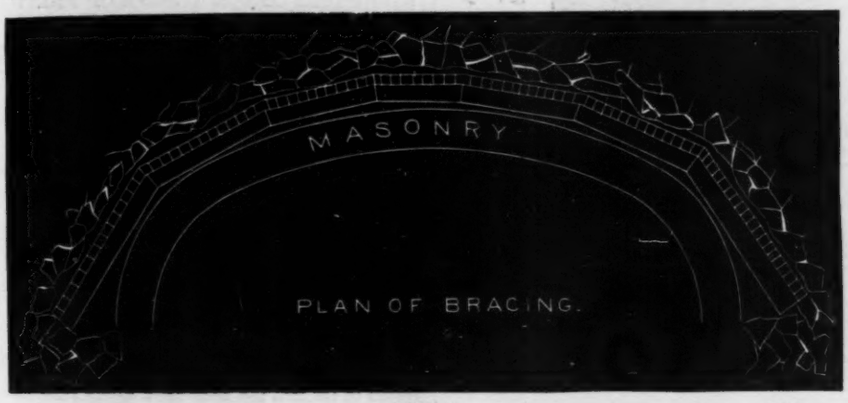

FIG. 2.

No support will be required for the roof of the tunnel for about three-quarters of its length: the remaining portion will be supported by brick masonry two feet thick and set in Portland cement. From the base to the beginning of the arch excavated rock will be used. The method of bracing is clearly shown in Fig. 2, when the loose material is held back by beams of wood. When a sufficiently firm resting place cannot be found at the spring points of the arch vertical pieces are added which are supported from the bottom. These timbers are 12 by 14 in., and so placed as to admit of the brick-work without their removal, as indicated in the drawing. When deemed essential additional security is obtained by running other timbers above those already mentioned, but in a longitudinal direction.

The tunnel is 27 ft. wide, 21 ft. high—or 19 from the top of the rails to the center of the arch—and the roof semi-elliptical. Fig. 3 presents a cross-section with a maximum engine and car. The distance between the centers of the track will

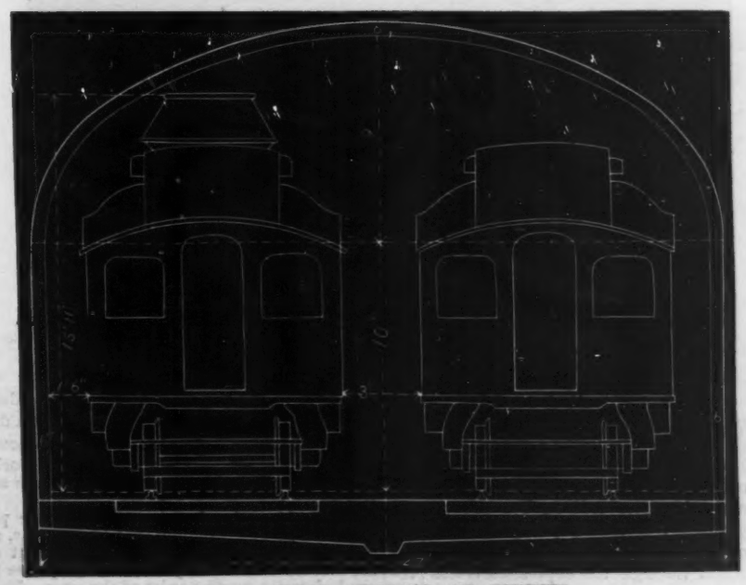

FIG. 3.—CROSS SECTION OF TUNNEL.

be 13 ft., the clearance between cars 3 ft., and between the side of the cars and the wall 1 ft. 6 in.

Rapid progress has been made since the commencement of the operations just fifteen months ago, the amount now finished being shown in the shaded portions of the profile drawing Fig. 1. The rate during May in the east heading of shaft No. 1 was 66.5 ft.; timbering delayed operations in the other heading. The combined progress of both headings in shaft No. 2, was 65 ft.; shaft No. 3, 100 ft.; No. 4, 96 ft., and in No. 5, 66 ft., making a total for the month of 393 ft. The total amount now finished is 2,429 ft., and there remains to be done 1,571, making a total length of 4,000 ft. The amounts finished at each shaft are as follows:

From east portal to shaft 1	460 ft.
" shaft 1 to shaft 2	321 "
" " 2 " " 3	315 "
" " 3 " " 4	326 "
" " 4 " " 5	149 "
Total of	1,571 "

Extending from the eastern to the western portal on the summit of the hill is a railroad, crossing the morass shown in the profile by means of a trestle, with side tracks at each shaft. Near the western extremity are three Blake crushers. The crushed rock is thrown over the western side and will be used as ballast when needed.

At the western approach we found two steam excavators at work—one upon each track. The rock is loosened immediately in advance of the machine by blasting, when it is lifted and dumped into cars, which are hauled by a locomotive to the dumping ground.

A short distance from the western portal the rock suddenly dips, forming a basin, as shown in Fig. 4. This was filled with sand covered with a layer of clay. Much trouble has been experienced from the water, and a trench two feet by two feet six inches has been built to carry the surplus away. This relieved the work to a certain extent, but as the water still gave much trouble while excavating a system of piling was adopted, as shown in Fig. 5. As the water flowed from north to south through the depression it was proposed to sink two systems of short piling seven feet apart about half filled with stone, as shown in the illustration. The filling has been omitted and only the piling driven. This plan is being carried out on the north side of the cut and has resulted in an almost perfect exclusion of the water from the work.

The approach cut to the western extremity will be 2,700 ft. long, and is being rapidly pushed toward completion.

The approximate quantities excavated and to be excavated are: In the tunnel, 80,000 cubic yards; in shafts 3,000 yards, and in the approaches, 180,000 yards.

In order to avoid sharp curves the mouth of the eastern portal will be trumpet-shaped, the enlargement beginning about 100 ft. back. The increase will be to 50 in. width, and a proportional height.

The force consists of an average of 450 men in the tunnel, working in two shifts of twelve hours each. The number on the approach is 200. The plant consists of 5 Rand compressors, about 50 Rand drills (in operation day and night), 4 locomotives (2 at the western approach, 1 on top and 1 at the east end), 2 steam excavators, 3 Blake crushers and boilers, hoisting engines and electric light apparatus at each shaft.

FIG. 4.—LONGITUDINAL VIEW OF BASIN.

APPLIED ELECTRICITY.

Prof. A. Graham Bell, the inventor of the telephone, for which invention he received a gold medal at the recent Paris Exhibition, and also the ribbon of the Legion of Honor, returned from Europe on the Servia on the 12th. He expressed himself much pleased with what he had seen at the exhibition, the most important features of which were the electric lights and the transmitted power machines. He said: "The display of electric light was very fine indeed. The electric motors and the railways were extraordinary. I think that the use of electricity to transmit power is going to bring about a revolution in mechanical appliances. The power transmitted is not less than 50 per cent. of that applied to the dynamo-electric generators, and as a method of utilizing power at a distance it is undoubtedly the best that has yet been discovered. Water-falls, the tides, any natural source of power, for example, may be used to work the dynamos, and the electricity may be taken almost any distance."

He considers the electric railway quite practical. He says: "I rode in that of Siemens, and I examined all of them carefully. They get rid of the locomotives entirely, because the power is applied directly to the axles of the cars. The Siemens road has a wire running alongside of the track upon which a traveling pulley is carried. With elevated roads, however, it would not be difficult to insulate the two rails and make them the conductors for the electricity. This could also be done on surface roads, but there would always be the difficulty that any conductor lying across the track would deprive the train of its supply of electricity. The dynamo motors I saw were all of the same general type. They all had moving armatures actuated by interrupted currents and reversed poles. Opposite to these were fixed electro magnates excited by induced currents. They worked very well and were easily managed."

Of Faure's batteries he saw "a very large number. They are really Gaston Planté's batteries and he should receive the credit for them. Faure modified the Planté battery and the apparatus exhibited by him should be called Faure's modification rather than Faure's battery, as it is generally termed. Planté's battery consisted of the lead plates with the nimium deposited upon them by electricity! Faure's modification was the mechanical instead of the electrical coating of the lead with nimium. The result of his modification has been to make the battery more instantly effective than it was before. While Faure has made a most important improvement, I do not think that the credit of the invention should be taken from Planté."

"Do you think the invention of these secondary batteries is an important one.

"Unquestionably. I think that it will solve the problem of the domestic use of electricity for purposes of illumination and as a source of power. If each house can have in it a store of electricity such as one of these batteries furnishes, the lights and power wanted can be supplied and the battery can be resupplied say once a day. This will make the supply constant and much more to be depended upon than the system of tapping the wires. It makes the source of the electricity used in a house individual and completely under the control of the householder. This I regard as an important prerequisite to any general use of electricity in houses. By the way, Planté received a gold medal from the exhibition, while Faure got one of lower grade."

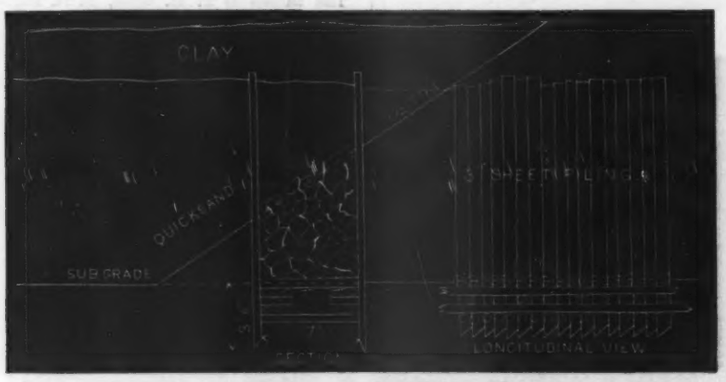

FIG. 5.—SYSTEM OF PILING TO PREVENT IFNLOW OF WATER.

THE HISTORY AND STATISTICS OF AMERICAN WATER-WORKS.

BY J. JAMES R. CROES. M. AM. SOC. C. E.

(*Continued from page* 189.)

CCCXXVIII.—WINONA.

Winona, Minnesota, in lat. 44° 2' N., long. 91° 40' W., on the Mississippi River, is on a plateau 12 to 15 ft. above the river, and surrounded by bluffs. Settled in 1851, it was incorporated as a city in 1857.

Water-works were built in 1876 by the city, after plans by J. B. Fellows and J. J. Randall. The supply is taken from two wells of 10 ft. and 16 ft. diameter, near the river bank. These wells are about a mile apart. From one of them the water is pumped by a Blake pump, and from the other by a Knowles pump, each in a mill, and the pumping is done by contract. The water is pumped directly into the mains under an ordinary pressure of 60 lbs. For fire service the pressure can be increased to 130 lbs., the limit of a safety valve on the main. The use of direct pumping is not considered satisfactory, and a stand-pipe 210 ft. high and 4 ft. in diameter is now in course of construction, and two pumping engines, one of 2,000,000 gallons capacity, with a compound condensing engine, and one of 3,000,000 gallons, with a compound duplex high-pressure engine. Distribution is by cast-iron pipe of from 16 to 4-in. diameter, of which 8 miles are in use, with 90 fire hydrants, 31 gates and 300 taps. For service pipes both plain and galvanized iron are used.

The population in 1880 was 10,208, and the daily consumption about 400,000 gallons.

The works have cost $100,000. The additions now in progress will cost $60,000. The bonded debt is $40.000, bearing 7 per cent. interest. The expenses in 1881 were $6,500, and the receipts $1,900.

The works are managed by a special committee of the Common Council.

A. W. Gage is the chairman of the Water Committee.

CCCXXIX.—OWENSBORO.

Owensboro, Kentucky, in lat. 37° 47' N., long. 87° 8' W., is on the Ohio River.

Settled in 1816, it was incorporated as a city in 1866. Water-works were built by a private company in 1879, taking the supply from the Ohio River and pumping directly into the mains by two Holly steam pumps with steam cylinders of 25-in. and pumps of 14-in. diameter and 28-in. stroke. The ordinary pressure is 40 lbs. and the fire pressure 100 to 140 lbs.

Distribution is by cast-iron pipe of from 10 to 4-in. diameter, of which 8 miles are laid with 76 fire hydrants, 25 gates and 400 taps. The city pays $50 per year for each hydrant. For service pipes, lead and galvanized iron are used.

The population in 1880 was 10,000 and the daily consumption 250,000 gallons.

The capital stock of the company is $80,000.

There is a bonded debt of $100,000, at 6 per cent.

The receipts in 1881 were $14,000 No further financial statistics are given.

H. P. Martin is the Superintendent, H. H.

Hodgson the Secretary and Treasurer and Samuel A. Muller the General Manager.

CCCXXX—MADISON, IND.

Madison, Indiana, in lat. 38° 46′ N., long. 86° 23′ W., is on the Ohio River.

It was incorporated as a town in 1825 and as a city in 1838.

Water-works were built by the city in 1849, after the plans of Thomas J. Godman and under the direction of Theodore R. Scowden, C. E.

The supply is taken partly from springs and surface water, impounded by a dam across a ravine, the reservoir holding 6,000,000 gallons, and partly from the Ohio River. The water is pumped by a plunger pump of 9½ in. in diameter and 72-in. stroke, into two reservoirs 212 ft. above the river, one of them being 80 ft. in diameter and 20 ft. deep, and the other 73 ft. in diameter and 16 ft. deep.

Distribution is by cast-iron pipe of from 12 to 4-in. diameter, of which 8 miles are in use, with 106 fire hydrants, 100 gates and 600 taps. Service pipes are of wrought iron. The population in 1880 was 9,009. The daily consumption is 400,000 gallons

The works have cost $100,000, which is the amount of the bonded debt at 8 per cent. interest.

The receipts in 1881 were $6,000 and the expenses of maintenance $5,000.

The works are managed by three Trustees elected by popular vote.

Charles E. Godman is the Superintendent and A. C. Pague the Secretary.

CCCXXXI.—ASHLAND, PA.

Ashland, Pennsylvania, in lat. 40° 48′ N., long. 76° 18′ W., is on Mahanoy Creek, in a mountainous region.

Settled in 1848, it was incorporated as a borough in 1857.

Water-works were built in 1876 by the borough, after plans of Isaac S. Cassin, C. E., taking the supply from Little Mahanoy Creek, a mountain stream which has its source on Broad Mountain, 1,400 ft. above the sea. A stone dam backed with clay, built across the stream 5 miles from the town and 345 ft. above it, forms a reservoir, from which the water is conveyed to the town in a 12-in. cast-iron pipe, 27,400 ft. long, and is distributed by 3 miles of cast-iron pipe of 8 to 3-in. diameter, with 30 fire hydrants, 34 gates and 450 taps.

Service pipes of lead and of wrought iron are used.

The population in 1880 was 6,014. The consumption is not known.

The works have cost $63,100, and the total receipts have been $10,483.07. The bonded debt is $53,000, at 6 and 4 per cent. interest.

The expenses in 1881 were $1,589.99, and the receipts $3,840.

The works are managed by three Commissioners elected by the borough Council.

Fred. Rodrian is the Superintendent.

CCCXXXII.—WOOSTER.

Wooster, Ohio, in lat. 40° 46′ N., long. 82° 56′ W. in a hilly country with numerous valleys and streams, is what is called the "second-bottom" lands between Killbuck and Apple creeks. There is a difference of level in two miles over which the city extends, of 290 ft.

Settled in 1809, it was incorporated as a village in 1817 and as a city in 1869.

Water-works were built by the city in 1869 after the plans of Emil Low, C. E., taking the supply from springs yielding 60,000 gallons per day, and the drainage of a water-shed of about 1½ square miles. A dam of puddled earth 300 ft. long and 20 ft. high impounds the water in a reservoir of 1½ acres, averaging 10 ft. deep, and 130 ft. above the lower part of the city.

The supply is insufficient and the quality of the water in summer is bad. An additional supply, by pumping from a stream which passes through the lower part of the town, is in contemplation.

Distribution is by 8½ miles of cast-iron pipe of from 12 to 4-in. diameter, with 88 fire hydrants, 30 gates and 220 taps.

Service pipes are of galvanized iron.

The population in 1880 was 5,933, and the daily consumption 200,000 gallons.

The works have cost $85,000. There is a bonded debt of $50,000 at 7 per cent. interest.

The expenses in 1881 were $400 and the receipts $1,300.

The works are managed by three Trustees. O. G. Coover is the Secretary, and M. M. Smith the Superintendent.

CCCXXXIII.—ROCHELLE.

Rochelle, Illinois, in lat. 41° 55′ N., long. 89° 13′ W., is on the Kaite River in a rolling country. Water-works were built in 1877 by the city, after plans by George C. Morgan, taking the supply from springs in an old quarry yielding about 300,000 gallons per day. The reservoir holds about 12,000,000 gallons. The water is pumped directly into the mains by two Worthington duplex engines, the second one erected in 1880. The ordinary pressure is 40 lbs. and the fire pressure 100 lbs.

Distribution is by two miles of 8-in. and 6-in. cast iron pipe, with 24 fire-hydrants, 4 gates and 40 taps. Service pipes are of wrought iron.

The population in 1880 was 1,896. The consumption is not given.

The works have cost $19,000. The bonded debt is $5,000, at 7 per cent. interest. No further financial statements are given.

The works are managed by a committee of the Council. G. F. Northrop is Chairman.

CCCXXXIV.—TUNKHANNOCK.

Tunkhannock, Pennsylvania, in lat 41° 32′ N., long 75° 57′ W., is in a valley two miles long and one mile wide, surrounded by hills, and on the Susquehanna River, at the mouth of Tunkhannock Creek. There is about 40 ft. difference of elevation in the town. Settled in 1780, it was incorporated as a borough in 1844.

Water-works were built by a private company a number of years ago, taking the supply from springs and conducting it through the town by bored logs. The date of construction of these works has not been furnished. In 1870 the works were reconstructed after plans of Harvey Sickler. The water is taken from four springs about 1¼ miles from the town, supplemented in dry seasons by a small mountain stream draining about ½ square mile and fed by springs. The water of this stream is collected in a small box reservoir 150 ft. above the town. Distribution is by four miles of cast-iron pipe, of from 8 to 3 in. diameter, with 10 fire hydrants, 9 gates and 150 taps. The town paid for putting in the hydrants and pays $5 per year for each one. Service pipes are of wrought iron, lap-welded.

The population supplied is 1,500. The daily consumption is not known.

The capital stock of the company is $20,000.

The works have cost $15,000 and the receipts have been $10,000. There is no debt.

The expenses in 1881 were $300 and the receipts $1,400.

In the spring of 1875, after very cold weather, with no snow on the ground, about 5,000 ft. of pipe laid 4 and 5 ft. below the surface froze and burst. Loose, gravelly soil froze deeper than clay. The pipes were relaid from 6 to 12 in. deeper, and covered with coal culm and spent tan bark.

Harvey Sickler is Secretary and Manager of the company.

CCCXXXV.—WARWICK, N. Y.

Warwick, New York, in lat. 41° 15′ N., long. 71° 13′ W., is in a hilly and rocky country, on Mistucken Creek. Settled in 1719, it was incorporated as a city in 1867.

Water-works were built by the city in 1872, after plans of Charles Caldwell, taking the supply from a small stream, about a mile from the city, and 150 ft. above it, impounded by an earth dam. Distribution is by 4 miles of cement-lined wrought-iron pipe, with 27 fire hydrants and 15 gates. The number of taps is not given. Service pipes are of wrought iron.

The population in 1880 was 1,050. The consumption is not known.

The works have cost $30,000. The bonded debt is $11,000, at 5½ per cent. interest.

The expenses are very small, and the receipts in 1880 were $700.

The works are managed by one Water Comissioner. B. F. Vail is the present incumbent.

CCCXXXVI.—HAMILTON, NEV.

Hamilton, Nevada, in lat. 39° 12′ N., long. 115° 39′ W., is in mineral-bearing limestone mountains 8,500 ft. above sea level.

Settled in 1867, it was incorporated as a city in 1869 and disincorporated in 1875.

In 1869 water-works were built by the Eberhardt Mining Company after plans of H. W. Von Schmidt, C. E.

The supply is taken from Illapah Springs, three miles east of Hamilton, where the water issues from a fissure in the limestone rock with an average flow of 1,200,000 gallons per day. There is scarcely any rain there and no apparent water-shed. The source is supposed to be in a mountain range 60 miles to the north. At the first pump station, 15 ft. below the spring level, two Cameron steam pumps with steam cylinders 22½ in. and pumps of 10-in. bore and 60-in. stroke, lift the water 500 ft. through a mile of 12-in. riveted wrought-iron pipe with cast-iron hub joints leaded. The pipe is ¼-in. thick for the lower 250 ft., and ⅛-in. above that. It frequently bursts. The second pumping station with two similar pumps then lifts the water 500 ft. more through similar pipe. The working pressure at each station is 217 lbs. and sometimes by irregular action of the pumps runs up to 250 lbs. To relieve the pipe compressed air is forced into 4 air chambers on the line. The water is delivered into a stone reservoir holding 200,000 gallons on the summit of Momomoke Mountain, 500 ft. above Hamilton, and distributed through 14 miles of 3-in. lap-welded wrought-iron tubing of No. 11 gauge, with cast-iron sleeve couplings and lead joints. This pipe has proved too light for the service, was not well coated with asphalte and has rusted through in wet ground. There are 20 fire hydrants, 10 gates, 125 taps and 20 meters. While Hamilton was an incorporated city it paid $1,720 per year for hydrant service. In 1880, after the White Pine mining excitement which created the town had died out, the population was 500 and the daily consumption 10,000 gallons.

From the reservoir a pipe conveys the water two miles across a deep valley and up the side of Treasure Mountain to the reservoir level, where a third pumping station is placed, and the water lifted 700 ft. through 1⅛ miles of pipe to the summit of Treasure Mountain and Treasure City.

The water pumped now is chiefly used for mining.

The works cost $380,000. No other financial statements are furnished.

Samuel Liddle is the Engineer and Superintendent.

(TO BE CONTINUED.)

ACKNOWLEDGEMENTS.—The receipt of statistics, as follows, is acknowledged with thanks: From Harvey Sickler, Secretary and Manager, statistics and water rates of the water-works of Tunkhannock, Pa. From Frank Rentz, Town Clerk, statistics and water rates of the water-works of Ashland, Pa. From B. F. Vail, Water Commissioner, statistics and water rates of the water-works of Warwick, N. Y. From G. F. Northrup, Chairman Fire and Water Committee, statistics and water rates of the water-works of Rochelle, Ill. From H. P. Mastin, Superintendent, statistics and water rates of the water-works of Owensboro, Ky. From A. W. Gage, Chairman Water Committee, statistics and water rates of the water-works of Winona, Minn. From Samuel Liddle, Chief Engineer, statistics of the water-works of Hamilton, Nevada. From M. M. Smith, Superintendent, statistics and water rates of the water-works of Wooster, O. From A. C. Pogue, Secretary, statistics and water rates of the water-works of Madison, Ind.

RAILWAY TIE AND BRIDGE TIMBER CULTIVATION.

A St. Louis paper says:

The preservation of railway ties and bridge timbers from the destructive moisture of the soils and climate of the Southwest has long been a troublesome problem among the railway managers. Several works representing large capitals have been established here for the treatment of wood by the creosote and other processes, which increase its durability, but the treatment is quite expensive. Some railway men have concluded that the allantus and catalpa will prove to be the cheapest and most durable wood for tie and bridge timbers. One company, whose road extends chiefly over prairie lands, is having a large plantation seeded for these trees in equal proportions. Both the catalpa and ailantus are readily propagated from the seed, and bear seed-pods abundantly. Another company, whose road enters Texas, is arranging to plant several hundred acres of these trees in that State. Even the Iron Mountain Company, who probably own more heavily timbered land than any other in the country, have contracted for the cultivation of a catalpa farm near one of their stations in Missouri. On this road are catalpa ties that were laid nearly fifteen years ago, and are apparently as sound as ever. It is authenticated that in Southern Ohio, where one species of catalpa is indigenous, there are posts and timbers of this wood that have been in ground a full century and yet show no signs of decay. These are hardy trees, and of a very rapid growth. Although the ailantus is an importation from China, still it and the catalpa seem to find in climates and soils of Missouri, Arkansas and Texas just what they require to thrive upon. It is now certain that they will for some years, if not permanently, receive extensive attention from the railway managers of the Southwest.

THEY ARE BLESSINGS.

Half the business men visited by newspaper solicitors and asked for advertisements consider the newspaper men as a kind of infliction of Providence, which must take a certain course before being cured. This is error. The newspaper, instead of being a sort of visitation from the lower world, is a public necessity, and for the public good. Instead of dead-beating its way in the world, it thrives upon money hard-earned, and for which it frequently pays, in one way or another, two hundred cents for a dollar. Business men have made fortunes, have risen from poverty opulence, simply from the benefits of the newspapers across the way. The money the newspapers make is handled by the men who patronize with their business advertisements. Some men say, with a sort of pride, "We never advertise. It's too much like throwing money away." Perhaps so, but the man who advertises extensively has the qualities essential to business success. The advertisements placed in papers are like the kindheartedness of youth, bearing fruit at first and reaching into the years when age comes on apace.—*Reading (Pa.) News*

ENGINEERING NEWS

AND

AMERICAN CONTRACT JOURNAL.

Tribune Building, New York City.

GEO. H. FROST.....EDITOR AND PROPRIETOR.

JULIUS W. ADAMS,* Past President A. S. C. E., } ASSOCIATE EDITORS.

S. D. V. BURR.....

SATURDAY, JUNE 17, 1882.

EDITORIAL ANNOUNCEMENTS.

*Communications for Mr. Adams should be addressed to Julius W. Adams, care of this journal, New York city. Articles written by Mr. Adams will be signed thus *; and only for articles so signed will he be responsible.

Terms of Subscription.—To the United States and Canada, $4 per annum, including postage; all parts of Europe, $5, payable in advance. Remittances at the risk of the subscriber, unless made by registered letter or by draft, check or P. O. order, payable to GEO. H. FROST.

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Articles for Publication in the current number should be received at the office of publication not later than Thursday morning, and advertisements not later than Friday noon.

Correspondence upon subjects which naturally belongs to the province of this journal is solicited.

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CORRECTION.—We have received a note from Mr. Dexter Brackett correcting an error we inadvertently made in our article of last week "Concerning Water Meters." The paper to be published in the *Journal of the Engineers' Association* will be a description of experiments with the Deacon waste water meter system.

TUNNEL PROGRESS ON THE N. P. R. R.—The following table shows the progress made in the east face of the Mullen tunnel from the time of the commencement of operations in December last to June 1:

	Linear feet.	Progress per day. Feet
December	22	
January	117	3.77
February	96	3.43
March	126	4.06
April	135.5	4.52
May	147.5	4.75
Total	644	

Each succeeding month shows a decided increase in the rate of progress, attributable, in a great measure, to more systematic methods of working. The material through which the tunnel passes is granite. Drills run by compressed air are used, and high explosives for the blasting. The total length is 3,850 ft., and, as work is pushed day and night, the present rate of advance will soon pierce the mountain.

RAILROADING IN MEXICO.

The stimulus which has pushed forward the projected railroad lines in Mexico has been different in many respects from that which urged the first Pacific across the continent. The latter was assured of a through traffic from the eastern countries, which would instantly be of sufficient magnitude to pay, and which would be soon followed by increased and more frequent shipments. The Mexican roads will not receive a through trade of remunerative proportions until after a market shall have been established, and until the agricultural and mineral resources shall have been developed. That they are vast, and are only awaiting a judicious application of energy and capital to become financially successful, is well known. Wealth will not be liberally expended in any section when the result cannot be immediately sent to a market demanding such effects. The railroads will accomplish the settlement of the country, the rate of advance depending largely upon the climate, and especially upon the treatment received from the citizens and the government. The aspect of the whole region, especially for the next few years, will be influenced by the class of immigrants who go there, and their object in going. Honesty, perseverance and fearlessness are prerequisites and of much more avail than money.

Reports from all the roads whose lines are back from the shores in the mountainous regions, are most encouraging as regards rapid progress and early completion. The climate is most salubrious, and the trouble experienced by foreigners upon their first arrival almost entirely overcome. Routes along the coast in the low lands are suffering for want of both engineers and laborers, the climatic influences being of such a character as to almost prevent the residence of individuals for a long enough time to become accustomed to them.

Much difficulty has been encountered on the branch of the Mexican Central from Aguascalientes through San Luis to the coast of Tampico. Mexican laborers from Tampico were not a success; gangs from the interior succumbed to the work and the weather. The importation of negroes from New Orleans was a total failure, and we now learn that the road is being built by a force of about 500 Mexicans who have become thoroughly acclimated. We learn from a recently returned engineer, who was engaged on this work, that only from 25 to 30 miles of track have been laid from Tampico, although operations were commenced about one year ago. They are now working in both directions from a point about midway between San Luis and Tampico. The main line has been completed for a distance of 200 miles from the city of Mexico, and is being pushed ahead rapidly, although the engineering difficulties met in the mountains often have a formidable aspect. The financial condition of this portion is good, the local traffic paying well at present, and growing rapidly.

The salaries paid engineers range from $125 (Mexican money) and expenses, for levelmen, up. Laborers get 75 cents per day of ten hours on the branch road, and it is probable that this can be reduced when the line reaches the interior.

THE PANAMA CANAL.

For some time past there has been but little matter—purporting to be information—in regard to the progress being made on the canal. The political side of the question has been freely discussed, yet as our main interest centers not in the scheme but in the practical execution of the scheme, and in the means by which the project is to become a fact, we have had only the most meager items to present.

On May 24 we sent a letter to Messrs. Huerne, Slaven & Company, of San Francisco, requesting information in regard to a contract for certain work on the canal which we understood had been signed to them. Early this week we received a reply headed Nevada City, Cal., and signed by "Slaven Bros., per O. P. Pell, of New York City," to whom our note had been forwarded for his perusal and answer. The letter states: "We have, as you already know, secured a contract to dredge and remove earth (to the depth and width of the proposed Panama Canal) for several miles, commencing at Colon-Aspinwall. Our contract embraces the removal of about 6,000,000 cubic meters of earth, for which we are to receive about $2,000,000. The work will all be done by patented machinery—three 'Hercules Dredging Machines,' requiring but two crews of 7 men each, for each day of 16 working hours, and will complete the whole work inside of 18 months."

It is claimed that this dredge is particularly adapted for work of that character, and in a climate so severe upon the men, and that it will do the "work of one thousand men per hour," or 24,000 cubic yards per day of 16 hours. The machinery for one dredger is nearly completed and ready to ship as soon as the hull of the boat is ready to receive it, and the two other machines are under contract; the estimated cost of the three, delivered at Colon, Aspinwall, is something over $500,000. The writer, in a note, says that "the contract was awarded to Slaven Bros. per Huerne, civil engineer."

From this letter we learn that a contract has actually been entered into for a certain amount of work on the canal. We also learn that no work has yet been done at Colon-Aspinwall, nor will be until the completion of the three dredges. We regret that the writer was not more explicit in regard to the exact character of the work to be done, the distance to be excavated, the disposal of the material, the contract price per cubic meter, the payments on the contract, and many other little items which would be of interest. We would also have liked a description of the Hercules dredger.

TO HARNESS NIAGARA.

Now we have an ambitious company with a far reaching and most comprehensive title announcing its intention to harness the great falls of Niagara, and by the aid of electricity generated therewith furnish light, heat and power to any one who has the requisite moneys to pay therefor and who may reside in any city in North America.

These attacks upon the beauties of Niagara seem to occur periodically, and almost all of them have been pronounced feasible and received the endorsement of eminent men of science. The single exception that we now recall was to that of the citizen of the U. S. A. who was asked while gazing at Vesuvius when in active operation, "If they had anything in America to equal that?" The citizen quietly responded: "No! but we have a water falls that would put that fire cut." This scheme failed to receive any encouragement, mainly from the fact that there was a slight difference in the elevations and that the difference occurred on the wrong side.

The project of a chain of mills fed by an immense sluice came to naught, for what reason we do not remember.

That of another enterprising citizen—from the East—who wanted to build a huge water-wheel to turn a shaft extending through the States, and let any body "belt on" who so desired, failed of accomplishment for some unaccountable cause.

Now we have the electric scheme, which is perfectly practicable. The force of gravity acting upon the water would give ample power to generate all the electricity needed; copper wires of the right size would convey the current to any desired point; dynamos would drive the machinery in all the factories. There is no doubt that all the apparatus essential to the success of this scheme could be placed in position. The questions of waste of power at the falls, loss of electricity at each end and during transmission, do not enter into the problem, as the source of all is inexhaustible—even in dry weather there would be more than enough of the tumbling water. Money is all that is wanted; but this is like other ventures, and capitalists are very wary in regard to expenditures.

Should the undertaking prove successful, a few falls in South America, a good sized one in both Africa and Australia, one or two in the Himalayas for Asia, and quite a large one for Europe, and we have the inhabitants of the earth supplied with a servant ready at any time to do their bidding.

WASHINGTON WATER SUPPLY.

The bill before the House of Representatives relative to increasing the water supply of the District has been passed. An amendment provides that the cost of the improvement shall be annually computed and stated by the Treasurer of the United States and charged to an account on the Treasury books, and that the interest shall be annually included in the District tax levy, and paid to the United States Treasurer, and that any surplus of water rents over the running expenses of the works, and the paying of prior interest charges now existing, shall also be paid to the Treasurer and credited to the account thus created until it is paid.

The execution of this bill will afford an ample supply for the residents as well as the government, both for the present and the near future. The entire cost of the works up to the present time has been about $5,000,000, and the daily rate of supply has been, in round numbers 26,000,000 gallons. The expenditure of $1,500,000, in accordance with the provisions of the bill, will increase the supply to 80,000,000 gallons per day. There have been laid 175 miles of mains, exclusive of service pipes, and these are subject to the control of the general government. During the past ten years the annual receipts from water rents have averaged $138,000.

PERSONAL.

CONGRESS has abolished the office of Water Register of the District of Columbia.

J. C. JAMES is chief engineer and superintendent of construction of the Canadian Pacific Railway.

MR. F. C. HAND has been appointed Chief Engineer of the San Pete Valley Railroad, with office at Wales, Utah.

THE English Civil Engineer Douglas is to be knighted for his successful work in the erection of the new Eddystone Lighthouse.

The firm name of PANCOAST & TARR, of 28 Platt street, this city, manufacturers of water and gas-works supplies, has been changed to PANCOAST & ROGERS.

LIEUT.-COL. THOMAS MCNEISH, a noted contractor, and brave soldier in the late Rebellion under Gen. Rosecrans, died at Nanticoke, Pa., Sunday afternoon, aged 49 years.

MR. C. S. DWIGHT has been re-elected chief engineer of the Chester & Lenoir (N. G.) Railway Company; Mr. James Mason, superintendent and treasurer, and Mr. R. E. Waddill, road-master.

J. G. MACKLIN, for many years chief engineer of the St. Lawrence & Ottawa Railway, has been appointed chief engineer of the entire Midland Railway Combination between Toronto and Ottawa, embracing the different links and railways.

MR. E. S. CHESBROUGH, formerly City Engineer of Boston, now Consulting Board of Public Works, this city, has been paid $1,000 for advice and report on the drainage of the city of Winnipeg, and his services retained for one year at a salary of $3,000 as consulting engineer on drainage and sanitary matters.

MR. VERPLANCK COLVIN, superintendent of the Adirondack survey, has appointed Mr. Fred. Mather, of the United States Fish Commission and *Forest and Stream*, as the naturalist of the survey, with instructions to collect and report upon the fishes of that region. The party will enter the woods at Blue Mountain Lake on the 15th inst.

A. A. ROBINSON, Chief Engineer of the Atchinson, Topeka & Santa Fe Railroad has issued the following order: Mr. F. Leach, Jr., having resigned the position of assistant engineer of the Rio Grande division, Mr. H. L. Marvin is hereby appointed his successor, under the title of resident engineer. All employes of the engineering, track, bridge and building, and water service departments, heretofore reporting to Mr. Leach, will report to and obey orders from Mr. Marvin, whose address will be San Marcial, N. M.

ERASTUS W. SMITH, A. P. D., died at his residence, 42 Dominick street, on the 12th inst. He was a native of Mansfield, Conn., and was well known throughout the country as a consulting engineer. He was the first to receive the degree of Doctor of Physical Arts from the New York University. He had been connected with the Ocean Steam Navigation Company, the Collins line, the New York & Havre Steamship Company, the New York, New Orleans & Havana, the Merchants' Steamship Company, the Norwich & New York Transportation Company, and the North America Steamship Company, either engineer-in-chief, constructing engineer, or superintendent of machinery. He designed and constructed the New Orleans water-works.

JOHN SCOTT RUSSELL, the famous engineer, died in London on the 9th inst.

John Scott Russell, M. A., F. R. S., Vice-President of the Institution of Civil Engineers and the Institution of Naval Architects, eldest son of the Rev. David Russell, was born in the Vale of Clyde in 1808, and received his education at the universities of Edinburgh, St. Andrews and Glasgow, graduating from the latter at the age of 16. He early evinced a liking for practical mechanics, and his father permitted him to take employment in the workshop as an engineer, afterwards assisting him in his studies in cognate sciences. He made such advances in these that on the death of Sir John Leslie in 1832 the young engineer was selected to supply temporarily the Chair of Natural Philosophy in the University of Edinburgh. From this time his career as a practical engineer and shipbuilder became decided. While at Edinburgh he built several small boats for canal and river navigation, and constructed steam carriages for common roads, which ran between Paisley and Glasgow. In London he constructed four large steamships, the Teviot, Tay, Clyde and Tweed, for the West India Royal Mail Company. As a shipbuilder he investigated the laws by which water opposes resistance to the motion of floating bodies, and he established the existence of the "wave of translation" on which he founded his "Wave System." In this science he actually made 20,000 experiments in a few years. The first vessel constructed on his wave principle was the Wave; then followed the Scott Russell, the Flambeau, the Fire King, the Great Britain, and finally the leviathan ship the Great Eastern, so closely connected with the history of Atlantic cables. He was elected Fellow of the Royal Society of London and member of the Institution of Civil Engineers, of which he was Vice-President. He was also a member of the British Association. He was one of the founders of the Institution of Naval Architects, and contributed to it many valuable papers. He compiled a large treatise on "The Modern System of Naval Architecture, for Commerce and War;" also a work entitled "Special Technical Education for the English People." In 1871 he came before the public with his scheme, "The New Social Alliance," by which he aimed at amalgamating political parties and improving the workingman's condition. His writings on the naval transport of railway cars with their freight and passengers received much attention, and the system he proposed has been adopted at many points with success.

GREENE'S Bridge Trusses, 1st Edition, is selling off very rapidly at 60 cents per copy. Postage stamps will be received. When stock on hand is sold the book will be out of print.

JOHN NOLEN, a Philadelphia contractor, put in the only bid that was given for the paving and keeping in repair of the highways, bridges, etc., in the Chestnut Hill district for the present year. The amount was $6,500, which was rejected by the Commissioner of Highways, who, upon readvertising, let the same work upon a single bid for $2,500. Nolen brought suit and has obtained an injunction restraining the Commissioner from awarding the contract. It is claimed for Nolen, that, in the advertisement for proposals the Commissioner failed to reserve the customary right to reject any or all bids, and that, therefore, Nolen being the only and consequently the best bidder is entitled to the contract. We have not learned the decision.

RECENT INVENTIONS.

SUBMARINE VESSEL.

A recent English invention consists of a steam propelled boat for navigating the water below the surface. In its arrangement and construction longitudinal stability rudders are provided, operated by means of a hydraulic engine, whereby the horizontal position of the vessel is preserved. The valves of the vessel are controlled by a swinging pendulum. The vessel is caused to ascend or descend in the water, by the revolution of screw-propellers mounted on the vertical axis at its sides.

TELEPHONE.

Edison's invention for this week consists of an improvement of the telephone; its object being particularly directed toward providing a tension regulator for the vibrating diaphragm in the mouth piece. The whole of the diaphragm is free to vibrate under the action of sound. The tension regulating device is at one side of the diaphragm, and a spr ng is employed which acts to press the diaphragm toward the tension regulator.

NOVEL PROCESS OF PRODUCING COLORED PICTURES FROM PHOTOGRAPHS.

This improved way of photograph coloring consists of the following successive steps: first, in fixing the paper on which is the picture to a plate of glass, by means of a cement composed of amylum, water, nitrate of strontia, granulated sugar and gum arabic; second, removing almost all the paper fiber by abrasion, leaving only a thin film adhering to the glass; third, coating this film with a hot solution of paraffine and beeswax; fourth, coloring the back of the picture; fifth, excluding air from the same by cementing another glass transparent plate to the back of the first, and retouching the colors on the back of this plate; and, sixth, applying a third plate or board set back of thesecond plate, and frosted or covered with colored fabric.

DEVICE FOR CLOSING WINDOW SHUTTERS OF LARGE BUILDINGS IN CASE OF FIRE.

This invention relates to a method of rapidly releasing self-closing shutters from the fastenings which hold them open. Its object is to provide for the closing of such shutters, in case of an extensive fire, by means capable of being operated from the outside as well as the inside of the building, so that the shutters can ordinarily be left open for a limited time, thus allowing exterior access to be had to the windows for throwing streams of water in case of fire within the building, and accomplish this object by means of vertical rods or chains supported in position between the windows and capable of being moved longitudinally. These rods are connected with bell-crank levers so arranged with relation to the fastenings by which the shutters are held open that the vertical movements of the rod and consequent oscillation of the bell-crank levers detaches the fastenings from the shutters, and thus releases the shutters to the action of the springs by which they are closed.

ELECTRIC INCANDESCENT LAMP.

A new electric incandescent lamp consists of two electric elastic carbons over-lapping and in loose contact with each other, and inclosed in a transparent or semi-transparent chamber in which a vacuum is maintained.

NEW INSULATING MATERIAL FOR ELECTRICITY.

A Swiss invention treats siccative oil—such as

linseed oil—transformed by heat into a solid body. About an equal quantity of resin is added during the transformation. This compound is designed to take the place of silk rubber, and the like in the coating of electric wires to insulate them.

MANUFACTURE OF ICE.

This improvement consists of an ice-house, the walls of which are adjustable double curtains of felt or other heavy fabric to inclose ice frozen by natural cold and protect the ice from warm outside air. The curtain walls are adapted to be lowered from the top to expose water to cold outside air to form more ice.

AUTOMATIC CASH-CARRIER FOR STORES.

Quite a number of recent patents have been issued for devices for doing away with the cash boy in large retail stores. The latest invention of this class provides an inclined way or trough, leading to the cashier's desk from the counters, and a reversely-inclined trough leading back again. Within these ways or troughs travel-rolling spheres or balls contain the money.

GLOBE FOR ELECTRIC LIGHTS.

An important invention has for its object to provide a clear or transparent shade, adapted to soften or reduce the intensity of the light without lessening its illuminating power, thereby obtaining all the advantages of the soft and pleasant light produced by the ground or semi-transparent globe. This globe is formed with a smooth interior surface, but its entire outer surface is formed of small contiguous pyramidal projections; so that each projection is a separate and distinct body to diffuse the light in all directions.

WASHINGTON, D. C. F. B. BROCK.

CORRESPONDENCE.

CALCULATING "OVER-HAUL."

PITTSBURGH, June 12, 1882.

EDITOR ENGINEERING NEWS:

"G. A. M." inquires in your paper of May 25 as to methods of calculating *over-haul*.

So far as I can learn every engineer has his own process, and there is not as there should be an acknowledged method of determination. The following has been my practice: Suppose, for convenience, the price paid is 2c. for every yard hauled 100 ft. after the first 100. Prepare a table of stations and quantities both for excavation and embankment. Then, starting at "grade," determine the station containing the *center of mass* of cut. In the same way find the center of mass of the fill made from the cut. Multiply the distance between the two, *minus the* 100 *ft.* (hauled free), by the amount hauled. From this subtract the amount obtained in the same way for the quantity next the grade point whose extreme haul is 100 ft. The answer multiplied by 2 gives the cost in cents.

This method though not exact is sufficiently accurate in ordinary cases.

Price of excavation per cubic yard divided by cost of haul per unit of length plus length of free haul = economical limit of *extreme* haul.

The tedious calculations of haul may be done away with by the use of the averaging machine designed by Mr. Auchincloss, mentioned in ENGINEERING NEWS some time ago. ALPHA.

LOCATING CURVES.

RIO GRANDE EXTENSION COMPANY,
SALIDA, Col., June 7, 1882.

EDITOR ENGINEERING NEWS:

Two curves have been run, one to the right and the other to the left, with a tangent 100 ft. long between them, the former being a 20° curve containing 60° and the latter a 12° curve containing 48°.

After completing the above it is found that the latter curve strikes 25 ft. too far right.

How many degrees must be "thrown off" the 20° curve, preserving a tangent 100 ft. long and the 12° curve, to strike the point 25' left of end of 12° curve, or more correctly, a tangent 25' left of first arrived at?

What simple rule would apply to cases of this kind, the object being to preserve the same rates of curvature in both cases and the tangent 100' long? By inserting the above you will oblige

Yours truly, A SUBSCRIBER.

RELOCATION OF RAILROADS.

PORTLAND, Me., June 4, 1882.

EDITOR ENGINEERING NEWS:

Given, A line of railroad, single track, which has been in operation some thirty years, curves originally compounded, but by use and "lining in" somewhat changed from original position, intersection points in most cases inaccessible, and no apparent way of locating points, tangent and curve more definitely than by inspection, original location so defective that but little dependence can be placed upon it as recorded.

Required, To make a relocation of the line as it now is, substantially in accordance with the directions prescribed by the Massachusetts Board of Railroad Comissioners, rule No. 2 of such directions reading: "Said maps shall show the course of the tangents and the radii of the curves of the center line in question; the radius of the land taken, specifying such radius on each side of the center line; also the course of the division lines between the lots over which the location is made, and the distance between them on the curve line. Where but one track is laid, the position of such track with reference to the curve line shall be shown, so that the boundaries of land may hereafter be determined by measurements from the track as laid, if the same shall not have been changed. Where two tracks are laid, it may be presumed that the curve line is midway between them. The course called for above may be either magnetic or true."

Rule 4 reads: "The description in writing must in all cases correspond with the map, and the two taken together must have the substantial certainty and precision of a deed."

Through the columns of ENGINEERING NEWS I would like to inquire what is the most feasible method of making such a relocation.

ENGINEER.

THE price of Latham's Sanitary Engineering, English edition, is $12. A few copies of the American edition can yet be bought of Van Nostrand at $3; we have none for sale. Our stock of 60 cent Greene's Bridge Trusses is rapidly diminishing, and those who want a copy at that price must buy soon. Stamps are acceptable, and there is no need to register.

ENGINEERS' SOCIETIES.

ASSOCIATION OF COUNTY SURVEYORS OF OHIO.

THIRD ANNUAL MEETING.

We have received from Mr. Fred. J. Sager, preident of the association, a copy of the proceedings at the third annual meeting, held in Columbus, Jan. 11, 12 and 13, 1882. The first in order were the reports of officers and committees and the transaction of miscellaneous business. Members of the Association presented resolutions referring to legislation on various subjects incident to the profession. A bill is now before the Legislature looking to the broadening of the surveyor's field of operations and clearly defining his position and duties. One section provides that "There shall be a State board of examiners, to consist of three competent persons skilled in civil engineering, and residents of this State; the members of this board shall be appointed by the Governor, one for one year, one for two years, and one for three years; and all vacancies in said board by expiration of term, resignation or otherwise, shall be filled by the Governor; the certificate of said examining board shall authorize the Governor to commission the holder thereof to practice land surveying in this State; and upon the presentation to him of such certificate, the Governor shall issue to the recipient of such certificate such commission." The following clause provides for the meeting of the examiners at Columbus, there to examine applicants as to their proficiency in land surveying. Each commission is to be recorded in every county in which the holders desire to make a survey. A bond of $2,000 must be deposited with the auditors of the county in which the holder resides. Each surveyor thus commissioned shall be empowered to take acknowledgments, administer oaths and take testimony regarding marks or monuments.

The following persons were elected officers for the year 1882-3: President, F. J. Sager, Vice-President, Jonathan Arnett; Second Vice-President, F. M. Davidson, Corresponding Secretary, W. C. Rowe, Recording Secretary, and Treasurer, Benj. Thompson; Executive Committee, C. W. Shoemaker, J. T. Buck, F. A. Born, D. W. Pampel and Jonathan Arnett; Legislative Committee, F. J. Sager, J. Arnett, J. B. Gregory, R. S. Paul and B. F. Bowen.

Mr. R. W. McFarland presented a communication detailing a simple and accurate method of finding the true meridian. Papers were presented by Mr. F. M. Davidson on Land Surveying and its phases; by Mr. J. Arnett on Magnetism and Magnetic Variation; by Mr. Fred. Howell, on The Office of County Surveyor; and by Mr. B. F. Bowen on Bridges.

STEEL SPECIFICATIONS.*

CHEMICAL COMPOSITION.

What modifications will be necessitated in specifications by the introduction of steel into engineering structures? It will generally be conceded that to the designer must be left the selection of quality, with special reference to the work to be done. To him it must also be left to decide where the lines between economical use of iron and of steel must be drawn. In this respect American engineers have many and great advantages over their English *confrères*—not the least of which is that we are not hampered by "Board of Trade Rules," "Admiralty Rules" and other circumlocution-office rules. The English "rules" allowing iron to be strained to 5 tons in tension, and steel only to 6 tons, would be simply prohibitory, with our ruling prices, to the use of steel in long-span bridges, where lightness is one of the most important considerations. It is the increased amount of mechanical work to which the steel must be subjected in bridge construction and shipbuilding that constitutes one of the most important points to be taken into consideration in the choice of material. These structures are composed of a series of members, subjected to unequal stresses, differing in degree and kind. Shapes vary widely, and are in many cases the result of very considerable mechanical work, and altogether the conditions of service are radically different from the uniform duty to be performed by rails or ship plates.

The specifications for the steel of a large bridge, properly proportioned, will therefore call for a number of grades of the metal, and cannot be taken indiscriminately from hundreds of tons of metal made from about the same raw material and by about the same process, or rather methods of manipulation. That the manufacturer cannot make structural steels for the price of steel rails is, of course, evident, and experience alone will ultimately enable us to harmonize the demands of the designer and the wishes of the steel maker who can furnish larger quantities of one grade at a lower grade than numerous small lots under detailed specification. It is, therefore, obvious, considering the intimate relations that exist between chemical composition and mechanical properties, that the engineer must have a voice in the construction of the formula by which the steel for his structure is to be made.

The writer is fully aware that steel manufacturers do not generally concede this, and some even look upon the introduction of chemistry into specifications as an encroachment upon their prerogative. They argue that the chemical composition is of no value to the engineer, as the physical properties are all that the latter has ultimately to rely upon. This is true in a limited sense only, and refers merely to the completely finished product. But the steel has to be worked into eyebars, has to be punched, riveted, sheared, shaped, hammered, annealed, etc., after it leaves the manufacturer. True, a variety of physical tests so extensive as to cover all these points might readily be devised by the engineer, but it is doubtful if the steel maker would not be put to greater inconvenience by being obliged to hold his mill pending such determinations, or to greater risk by turning out his product ahead of them, than by simply acquiescing in specifications which look to excluding, primarily, recognized elements of danger and failure.

* From "Structural Steels," by Albert F. Hill, in *The Iron Age*.

The engineer, having determined upon the strength and resiliance of the material suitable for his purpose, and knowing the deleterious influence of certain elements, and the source of annoyance they may subsequently become in the working of the material after it has left the maker's hands, has a right to limit their presence in the steel to a minimum, besides prescribing the physical tests the steel shall stand. All that is to be considered in this connection is how far the engineer may define both chemical composition and physical qualities, and still leave the manufacturer full scope to meet these requirements without any particular hardship and without enhancing the cost of production. These conditions will probably be best fulfilled by leaving the specifications for analysis incomplete. For instance, suppose the engineer desires steel bars which will have to be subsequently worked into eye-bars. The steel will have to undergo several times reheating, forging and annealing before it leaves the mill. We know that silicon acts as a precipitant, and will displace the carbon from its combination with the iron at a red heat. This element must therefore be reduced to a minimum. On the other hand, the presence of maganese in allowable ratio will be desirable rather than otherwise. Moreover, provision must be made for the unavoidable loss in strength consequent upon the several manipulations mentioned. Supposing it is therefore required that the steel of such bars shall have the following physical properties :

Ultimate tensile strength per square inch, pounds.	85,000
Elastic limit at, pounds	45,000
Elongation, per cent.	20
Modulus of elasticity not more than, pounds	31,000,000
Cold bending, degrees	180

There will be no particular hardship involved if the specifications require, primarily, that such steel shall show to analysis not more than

Phosphorus,	.05
Silicon	.04
Manganese	.50
Sulphur, copper, etc	.00

thus leaving the manufacturer free to vary the carbon percentage in proportion to the other elements, and to the extent necessary to produce or to meet the physical requirements. The finished product out of such steel—supposing all mechanical treatment to have been properly performed—will probably correspond very closely in its results to those obtained with about .30 carbon steel.

While a classification of the product in accordance with the carbon line is probably most easily understood by both engineers and makers in its general meaning, and therefore of great value, to specify simply the carbon percentage without reference to the ratio of the other elements would be worse than useless, while to specify the carbon, and to limit at the same time the percentages of the other elements, would throw the responsibility for the physical properties of the steel entirely upon the engineer.

Speaking in a general way, the range of steels most suitable for bridge construction will be found to lie between from .20 to .50 carbon, and several of these grades may advantageously be employed in the same structure—the lowest grades for members subject to transverse strains and fatigue from shocks, the medium grades for tension members, and the high grades for members under compression. This adaptation of the grade of the steel to the peculiar service for which it is required, constitutes the greatest advantage steel construction possesses, and if properly availed of, leads to the best proportions in the structure.

Much more light than we have at present on this subject is needed ere general rules for chemical composition can be even approximately laid down, and if the intelligent use of steel in structures is to become the rule rather than the exception, it will require cordial co-operation of designer and manufacturer. Only a full knowledge of the other's wants and means will enable each to solve intelligently the problems and elaborate the details pertaining to his field of practice.

BASIS OF STRENGTH.

If all the advantages that steel offers to the designer are to be reaped, our present methods of dimensioning must undergo considerable modification. Foremost among the changes most imperatively demanded, is the establishment of a basis for safety factors which shall truly represent the margin or ratio between the working load and the limit of usefulness of the material for structural purposes. This limit is reached at the point at which "permanent set" first takes place—generally, but erroneously, called limit of elasticity—and which might therefore be properly called the "safe strength" of the material. It is being more and more generally recognized among engineers that it is a fallacy to claim for a structure a factor of safety of six, because the maximum recurring stresses in it are about one-sixth of a load, the single application of which would produce failure. It will therefore be well to adopt primarily this "safe strength" or elastic limit as the basis to which the factors of safety are to refer. The knowledge of the ultimate strength is nevertheless of great importance, and will always, in a measure, guide the determination of the safety factor, but not by making it the basis for the latter. The intimate relation existing between strength and ductility finds further expression in the gradual increase of the ratio between elastic limit and ultimate strength, as the latter increases, so that this ratio of elastic limit to ultimate strength may be fairly said to be in inverse ratio to the ductility of the material. Now, the greater the range of elasticity in a material, the more ample warning it gives of its failing strength, and vice versa. Therefore this ratio of elastic limit, to ultimate strength may be used as a guide in the quantitative determination of the requisite factor of safety for a given structure or its different members. For instance, referring to the "safe strength" or elastic limit as a basis, a factor of 2 will probably be found quite sufficient in cases where this ratio of elastic limit to ultimate is as 1 : 2; but where we find this ratio larger, we shall also find a corresponding decrease in the ductility of the material, hence less warning of impending failure, and must therefore adopt a correspondingly larger safety coefficient.

Another point for consideration is the fact that the ratio of thickness to width exerts a considerable influence upon the tensile resistance. This will require to be taken into account in dimensioning very wide and comparatively thin eye-bars, and also in accepting test results of small specimens as a criterion of the strength of plates. In general, specimen tests will always give results from 10 to 15 per cent. in excess of what the full-sized members will show.

Altogether, dimensioning in steel, while it affords the designer exceptional opportunities for display of engineering skill, requires also careful consideration of the susceptibility of the material to treatment, and hence no attempt ought to be made to establish a uniform basis of strength, as has been done in iron construction, nor could any such attempt be fruitful of anything else than confusion and obstruction. Designers in steel will have to establish and to change constantly the basis of strength calculation with the adaptation of the greatest number of physical properties to the particular structure under consideration.

PHYSICAL TESTS.

To prescribe tests in such a manner that they shall be at once exhaustive indications of the characteristics of the material, and yet not become burdensome, is no easy task. It may be accepted as a general rule that specimen tests are of small practical value outside of the field of scientific investigation, and if made in sufficient number to become really serviceable in the course of a construction, their preparation in lathe and planer will take a great deal of time, and be a considerable item of expense. Of course, they cannot be altogether dispensed with, and are in some cases even the readiest means of settling a question at issue. For instance, if it is suspected that the steel has roll-hardened, or that it is burnt, duplicate specimens, one tested as it comes from the rolls, the other after annealing it, will tell a short, but very effective, story.

For the determination of modulus of elasticity carefully prepared specimens ought to be used, and the writer would call attention right here to the vital importance of this so generally neglected factor in strength determinations. Full-sized eye-bars are readily tested up to 1¼ to 1½, the maximum stress they are dimensioned for; this is fully within the elastic limit, and ought, therefore, to occasion no loss of material, and give at the same time definite indications of both strength and workmanship. For plates and angles the cold-bending test—before and after annealing—is the easiest of application, and, after all, the most decisive.

Where large presses are available, transverse tests of beams within the elastic limit and up to double the amount of calculated or allowed deflection, are readily and quickly made. The cutting of specimens from web and flange for tests is slow and expensive work, and tells but little. The drop test (under a hammer in guides and with equal heights of fall) will give very conclusive data, especially if comparison is made between the behavior of annealed and unannealed beams. Compression tests of small specimens are almost valueless, unless at least the proportion of length and diameter in the full-sized member is closely reproduced. An exhaustive series of steel-column tests is most needed at the present moment. Testing, of course, must include the effects of punching, shearing and annealing, but very few specimens, even in a large structure, will suffice for very good conclusions, if the other and preceding tests have been carefully made. Testing, without taking into account every detail that exerts influence, is apt to lead to serious errors, and is merely a useless waste of time and money.

INSPECTION.

Every engineer knows that no specifications were ever drawn for an important structure from which more or less deviation had not been made during the progress of the work; this being the case, it becomes evident that the inspector ought to be a man of large practical experience, as well as of sound theoretical knowledge, so that both constructor and manufacturer may be able to rely upon the soundness of his judgment. Unfortunately it is no uncommon experience in steel work to have an inspector reject in one case material which, though not quite complying with the letter of the specifications, is quite serviceable and acceptable, and in another case accept work and material which, though apparently in accordance with specifications, is unfit for use, and would be promptly rejected by the maker himself if he had an opportunity to decide.

In steel construction, probably more than in any other, the inspector is a necessary adjunct to the constructor; but ripe judgment, that familiarity with the material which can only be acquired in the mill and shop, and a thorough knowledge of the wants of the structure, coupled with the faculty of utilizing to the fullest extent the given means of the mill or shop, are absolute requisites for his usefulness. The sending of inspectors to steel works for educational purposes will be found fully as expensive to their employers as it is likely to be annoying and productive of loss to the steel maker, though it does occasionally afford some quiet amusement to superintendents and foremen.

The working of steel in every stage requires care, and, above all, intelligence, and the men engaged in it must be impressed with the necessity for careful manipulation and rational treatment.

PULLMAN SEWERAGE.

At the meeting of the Western Society of Engineers on Tuesday, a paper was read by Benezette Williams, late city engineer, and now in charge of the engineering work of Pullman, on "The Pullman Sewerage." The question of the disposal of the sewage of the new model town was a perplexing one, and Mr. Williams was authorized to make such investigations as might be necessary to devise a plan which should be in keeping with the other ambitions of the town. In view of the fact that the system finally adopted, and now in successful operation, possesses many new features, the substance of Mr. Williams' paper, describing it in detail, is given below. The paper is introduced by a description of the town, and a brief discussion of the merits of separate and combined systems of sewerage; that is, for rain or surface water, and sewage proper. It then proceeds as follows:

Pullman is a place for which the separate system is particularly well adapted, and for the following reasons: The site of the town is almost level, much of it not more than 7 or 8 ft. above Lake Calumet, making it impossible to obtain a gravity discharge to any other body of water than Lake Calumet. This lake is shallow—ranging from 1 to 8 ft. in depth. It is about 3 miles long and 1½ miles wide. It drains a small area, and is connected with Lake Michigan by the Calumet River, The river, however, which drains a much larger area than the lake, does not run through the lake, but is connected therewith by a small channel, through which the water flows from the lake to the river, or from the river to the lake, according to the varying conditions of winds and floods. In the absence of any adequate means of purifying itself, Lake Calumet is wholly unfit for a receptacle of sewage The small elevation of Pullman and the great distance to Lake Michigan render a gravity discharge thereto impossible. When a town cannot get rid of its sewage by a gravity discharge, the alternative is to use a pump. When a pump has to be relied upon, the exclusion of rain water from the sewers becomes almost a necessity, and when, as in this case, the surface-water can readily be carried off by a system of drains made for that purpose only, it adds strength to the reasons for fixing upon the separate system, which in this case was adopted for the reasons given, independently of its supposed sanitary merits.

The question of disposal, however, was not one that could be settled by the force of conditions. In selecting the place for and deciding upon the manner of disposal, there was room for a greater range of opinion and judgment, though, even in this the question was soon narrowed down to two parts. Lake Michigan could be reached with a pipe 6½ miles long, and, by pumping, the sewage could readily have been discharged therein The only alternative was land purification in some shape.

It was found that suitable land could be had three miles away, the title to which had been acquired by the Pullman Land Association. Estimates showed that a pipe could be laid to this land, a farm sufficient to dispose of the sewage of ten thousand people prepared, and suitable farm buildings erected for a less outlay than would be incurred in laying a pipe to Lake Michigan. It was believed that the farm could be made to pay expenses and the interest upon the money actually expended upon the farm proper, which would make the scheme of land purification considerably cheaper than the lake disposal, to say nothing of the objection felt to further contamination of a body of water that is already overcharged with

filth. The plan of sewerage was determined upon, and the laying of the sewers begun, in August 1880, soon after the writer was employed as engineer of the water and sewerage works for Pullman. Six months later, in February, 1881, the method of disposal was decided by the adoption of the sewage farm projects. October 18, 1881, the system was put into operation on starting the sewage pumps.

The system of sewerage is designed to reach a tract of land two miles long and an average of something more than a mile wide, comprising about fifteen hundred acres of land. To drain this district three mains have been provided, which center at the water tower. The mains leading from the north and from the west are 18 in. in diameter, and the one leading from the south is 15 in. in diameter. These mains are laid with a grade of 1 ft. in 1000 ft. The 9-in laterals are laid with grades varying from 2 to 4 ft. per 1000 ft., and the 6-in. laterals with grades of from 4 ft. to 6 ft. per 1000 ft., according to circumstances, the maximum grade in each case being the one size in all but special cases. At their starting point, the mains are about 16 ft. below the general grade of the town, the extreme ends of the 6-in. sewers in the alleys being about 7 ft. below the yards in the rear of the houses. The ground in which the sewers are laid is a hard, tough, drift clay. Man holes are 160 feet apart on the mains and generally 200 ft. apart on the laterals, being built also at every change of grade and direction. They are covered with a ventilating iron cover, with a trough or channel under the openings to catch dirt.

In all there has been laid at Pullman up to June 1, 1882, the following amounts of sewers of the various sizes, exclusive of house connections:

4,356	lineal feet of	18-in.	sewers.
3,176	" "	15-in.	"
680	" "	12-in.	"
3,600	" "	9-in.	"
12,000	" "	6-in.	"
500	" "	4-in.	"
24,312	lineal feet in all.		

In all cases outside of houses—in mains, laterals, and house-drains—salt-glazed, vitrified clay pipes of the Akron make have been used. Within the houses, soil-pipes are of iron, and were put in by the Durham House-Drainage Company, of Chicago. The vertical soil-pipes are wrought iron, coated with coal-tar, varnished, put together with screw joints, and the horizontal pipes are cast iron, with lead joints. The vertical pipes are 3 in. in diameter, and the horizontal pipes 4 in. in diameter. The horizontal pipe connects with the outside sewer without a trap. The vertical pipe runs through the roof, in all cases, full size. In most cases each soil-pipe has two or more water-closets connected with it. A pipe placed in a partition between two houses generally takes the soil for both houses. In cases of three-story flats, one pipe frequently has six water-closets connected. By these departures from the usual size of pipe and the usual manner of setting closets, a great saving in cost has been effected without inconvenience of any kind.

There have been—out of several hundred 3-in. soil-pipes that have been in use from two to eight months—perhaps six or eight cases of stoppage. But in every instance the stoppage was due to obstructions that got in during construction, and never to the use of a small-sized pipe. The results would unquestionably have been the same had 4-in. pipes been in use.

The sewerage system drains into a sewerage reservoir in the base of the water tower, the whole middle of the foundation of the tower having been excavated to a depth of thirty feet and all the space up to the grade of the sewers, not occupied by the walls, being used for storage. This holds about 200,000 gallons. Increased storage capacity can be had when needed by excavating a side chamber. It is expected that the present capacity will suffice for 8,000 population. Ventilation of the sewage reservoir is secured by means of eight flues lined with 12-in. sewer-pipe, built in the buttresses of the tower and opening at a height of 165 ft., and, also by a 20-in. pipe leading to the large chimney of the car-shops. The ventilation thus secured is perfect. The reservoir is arched over with groined arches, forming a floor for the sewage and water pumps, 10 ft. below the surface of the ground. The sewage pumping engines are direct-acting, compound-condensing, with piston pumps, each having a capacity of 2,500,000 gallons in twenty four hours. They were made with the special object of getting machines which would pump everything to be found in sewage, either of an ordinary or an extraordinary character. It was considered desirable to avoid screening or settling the sewage at the reservoir. All the sediment which collects in the reservoirs by incidental settling is from time to time washed loose with a hose and passed off with the liquid sewage. In order to accomplish this work a rubber valve of special make is in use. Without taking time to describe the valves now, it will be sufficient to say that thus far they are working to great satisfaction. Cotton waste, large cloths, sticks and blocks of wood have passed through the pumps frequently; indeed, many such substances are daily passing without injury or inconvenience. Barring the riveting of two parts of the rubber together, where they were at first imperfectly joined, no repairs have been needed, and there is nothing to indicate aught but a long life for the valves. The pumps were made by the Cope & Maxwell Manufacturing Company, of Hamilton, O.

The sewage is conveyed to the farm by a 20-in. cast-iron main, nearly three miles long. The farm end of this main connects with a closed, screening-tank, by means of which all material that will not pass through a screen of ⅛-in. mesh is intercepted. The tank is 6 ft. in diameter and 24 ft. long, made of ¼-in. boiler iron. It is set vertically, with its lower end high enough above the floor to admit of a wagon being driven under it. The material intercepted by the screen is lodged in the lower part of the tank, from which it is removed from time to time. On leaving the tank, the sewage passes through a pressure-regulating valve, which limits the pressure that comes upon the pipes leading to the fields to about ten pounds. As an additional precaution against high pressure, an overflow-pipe is provided, which will absolutely, under all conditions, prevent the pressure from rising above the limit. This pipe comes into play occasionally when the pumps are started suddenly without giving the valve time to act. The valve is purposely made to act slowly, in order to avoid the influence of pulsations in the engines and irregularities from other causes. A pressure on the interior of the thin steel disks above the valve raises the plunger, and closes the ports through which the sewage passes. If the pressure falls the ports open gently. Vibrations of the valve from sudden changes of pressure are prevented by a plate between the valve and the steel disks, through small holes in which the sewage has to pass in order to increase or diminish the pressure on the disks. The upper part of the tank, above the screen, is an air chamber, and answers the usual purpose of such an adjunct in preventing shocks from irregularities in the pumps, or by the sudden stopping of the flow of sewage. The tank and valve are housed in, and can be kept warm to prevent freezing in cold weather. The reason for introducing the pressure-regulating valve between the screening tank and the field is to make it possible to distribute sewage safely through clay sewer-pipes under pressure.

The main distributing pipe is 18 in. in diameter. From this main four lines of 9-in. pipe, 315 ft. apart, are laid across the field. Every 320 ft., on each line of 9-in. pipe, a hydrant is set, thus giving one hydrant to each 2½ acres, or thereabouts. On an 80-acre tract, which is now being underdrained, it is probable that two lines of 12-in. pipes will be used to distribute the sewage. This tract lies more favorably for surface distribution than the one prepared last year, and it is believed that fewer lines of pipes and hydrants will be sufficient. The pipes laid last year for distributing the sewage were of Akron make, with socket joints. The first pipes ordered were made with 3-in. sockets, but it was afterward found that sockets of ordinary depth would make a tight joint.

Before laying the pipes it was thought best to make a test as to whether weak or cracked pipe could be detected by ordinary inspection. An application of hydraulic pressure developed the fact that no inspection possible to apply could be relied upon. Many pipes that looked rough and full of fine cracks, that would ordinarily be rejected, were found to be among the best. While, on the other hand, the clearest ringing and best appearing pipes were often the poorest. These results made it necessary to apply the test generally. The test applied was 20 lbs. pressure per square inch. It was soon found that this pressure would break too large a proportion—about two-fifths of the 18-in. pipe, so it was decided to lay the main in concrete without testing. The 9-in. pipes stood the test better, about one pipe in four being broken in the operation. This loss could be stood and still the sewer pipe be much the cheapest thing that could be used for the purpose. It was a noticeable peculiarity of the pipes that 75 per cent. of those that failed broke below 10 lbs. The bed of concrete around the 18-in. main was from from 4 to 6 in. in thickness. The bottom was generally made of the Utica cement mortar and broken stone, while for the top and sides Portland cement was used. The 9-in. pipes were laid with stiff Portland cement mortar mixed with an equal quantity of sand. A hemp gasket was tried at first, but it was soon found that the quickest and best way in every respect to make a joint was to make a bed of mortar on the lower half of the socket and insert the next pipe; then, with the trowel, to force the mortar into the annular space on the top until the mortar was forced through into the inside. Out of 7,500 ft. of pipe laid in this manner there has been found but one case of defective joints, and this was caused by a heavy rain during the pipe-laying.

The general conclusion from this experience in the use of clay sewer pipes to carry fluids under pressure is that for light pressure from 10 to 15 lbs. the smaller-sized pipes are well adapted to the purpose if proper care is used in selecting them and in securing the joints as they are laid. I consider it by no means certain that sizes up to 18 in cannot be profitably used, as I do not think that the lot of pipe of this size that we had was of the best quality. Thin pipes seemed to give better results than thick ones.

The system of underdrainage on 60 acres prepared last year consists of one main underdrain, from 6 in. to 12 in, in diameter, of sewer pipe, laid north and south, and emptying into a ditch that discharges into Lake Calumet, and of parallel lines of common tile, 2 to 4 in. in diameter, laid to an average depth of 3½ ft., and an average distance of 40 ft. apart. The tile were laid with strips of tarred paper tied around the joints. Ten ft. of tile were strung on a pole at the side of the trench, the joints wrapped, and the whole 10 ft. put in place at one operation.

As to any of the general results of sewage farming, it is too soon to speak from experience upon the Pullman farm. The ground was covered with a tough sod, much of it a coarse, wild grass, and was plowed late last fall. The sod is still so tough that it is impossible to put it in proper shape for irrigating the crops. Then the spring has been so backward, owing to wet and cold, that no kind of crops are much advanced in this region. Difficulty is also being experienced by the grass starting to grow upon the land where sewage has been applied during May. It is intended to underdrain, a rod apart, a portion of land best adapted to sewage purification for filter beds, to be used as a safety valve, when if applied to ordinary crops the sewage would be an incumbrance. Upon these filter beds some of the coarser kinds of crops can be grown. As soon as the farm has really been fairly started, which, owing to the reasons given, cannot be before next year, I see no cause to doubt the success of the enterprise.

There is one feature of the system of direct pumping of the sewage at Pullman which may be of interest. The pumps, screening tank and pressure-regulating valve are so arranged and are so dependent one upon another that notwithstanding the use of clay pipes for distributing the sewage the workmen on the farm can control the quantity of sewage received with perfect safety. They close and open hydrants to any desired extent and vary the amount of sewage discharged almost as they please without danger or inconvenience. The operation is this: If the sewer is flowing at any given rate and one or more outlets be closed the effect is partially to close the pressure-regulating valve, by a slightly increased pressure on the distributing pipes, and to transmit from the valve, through the force main, an increased pressure to the pumps, which are provided with a steam regulator that reduces the pressure of steam admitted to the cylinders. In order to avoid all possibility of injury to pipes or pumps in this operation, a stand-pipe with two overflows is provided at the pumps, as well as one at the regulating valve, so that there is an absolute guarantee against damage from the failure of any mechanical appliance. The stand-pipe connected with the pump-main in the tower is, measuring from datum, 54 ft. high to the first overflow, and 90 ft. high to the second overflow. These overflows are connected with a pipe which returns the sewage to the reservoir below the pumps, so that, if every outlet is closed at the farm, the pumps could continue to run with freedom. Should the pressure-regulating valve fail to perform its functions, the overflow pipe then will protect the clay distributing pipes from undue pressure.—*Chicago Times, June 9.*

NOTES.

THE RAILROAD BUILDERS.

The most important to us of all the railroad building now in progress is that in Mexico, which will soon bring us into commercial relations with her nine millions of people.

The Sinaloa & Durango Railway, which is to connect the Pacific port of Altata in the State of Sinaola with the city of Durango on the main line of the Mexican Central, will be completed to Culiacon about July 1. The grading is already finished to that point.

The road from Merida to Valladolid is advancing rapidly. This appears to be a recent project. It is not denoted on the maps which we have seen. Yucatan is a very promising State, lying directly south of the jetties.

The *Rio Grande Valley*, a paper published at Brownsville, Texas, says that the Matamoros road is now completed nine miles. This is one of the spurs of the Mexican National, and runs up the river to Mier, whence it strikes southwest into the hill country to Monterey on the main line.

Rails are now laid from Guaymas toward No-

gales, on the American frontier, at least 190 miles.

From Tampico on the Gulf to a point called Buena Vista, the road toward San Luis Potosi is running; it is thirty-two kilometers from Moralillo to Buena Vista. The completed track is therefore above twenty miles.

The main line of the National was 106½ miles beyond Laredo yesterday (May 26), and will arrive at Villaldama, 109 miles, Monday. The National has done splendidly lately.

The Puebla & Izucar de Metamoros road is progressing, twenty-two kilometers (about 14 miles) being laid.

More than 32 kilometers (about 20 miles) of track is now ready on the San Maftin Texmelucan road.

The extension of the Morelos road from Cuantla to Acapulco has to be commenced within four months.

The sum of all the subsidies, State and Federal, on all the lines of the Mexican Central is $30,923,400. The concessions aggregate 3,234 kilometers (or 2,009 miles). This does not include the Sonora line, from Guaymas to Nogales, which is now consolidated with the Atchison, Topeka & Santa Fe.

The subsidies of the National aggregate above $20.000,000.

The subscriptions recently invited by the National and Central have both been taken, $14,000,000 cash for the first and above $6,000,000 for the other. The Central subscriptions were more than $2,000,000 in excess of the amount required. The financial condition of both roads now warrants the hope of steady and rapid work. The National's bonds are advancing in the market.

A report being current in the City of Mexico that Gen. Grant had not succeeded in raising the necessary capital for commencing the construction of the Mexican Southern Railway, the *Two Republics* states that Gen. Grant said recently that he did not intend to push the construction of the road until the City of Mexico is connected with the United States by rail.

The City of Mexico is the most northerly point on the Mexican Southern. It is not stated whether the beginning of work awaits the arrival of the Gould DeGress road from Laredo via Victoria, or will proceed as soon as it can obtain transportation by the Central or National line. The Mexican government has approved the plans and profiles of the second hundred kilometers of the Gould-DeGress line south from Laredo.—*New Orleans Picayune, June 3.*

Coal Mining With Lime.

At last there appears a possibility that the terrible loss of life which annually occurs in these isles through mining accidents will soon be sensibly reduced. At the present meeting of the Iron and Steel Institute Mr. Mosley read a long and instructive paper on a new method of winning coal. The principal feature is that cartridges containing lime in a highly caustic condition are employed instead of explosives. After one of these has been rammed down tightly to the bottom of the shot-hole and "tamped," water is injected into the cartridge by means of a small force-pump and hose, and a rapid generation of steam then takes place, gradually rending asunder the coal in all directions, and, in short, performing all the duties of gunpowder or dynamite. It is too early as yet to say whether this process will prove applicable in all cases. When lately tried at the Shipley collieries it more than answered expectations, having worked 140 tons more coal in 100 hours less time than the wedge method did in the next "stall." Commercially, therefore, its success seems to be demonstrated under the conditions which exist at the Shipley pits. It is further claimed for this invention, apparently on good grounds, that it gives absolute immunity from gas explosion, as no fire or flame is generated; that it does not create any smoke or noxious odor; that unskilled labor can work it, and that the men engaged always have plenty of time to get away before the coal begins to fall. Should only a portion of these pretensions be established, coal winning by lime will assuredly replace all other methods.—*London Globe.*

LITERATURE.—In the *North American Review* for July, the leading article is a profound and sympathetic study of "Emerson as a Poet," by Edwin P. Whipple. The author has scarcely a word to say about forms and modes of expression, and cheerfully concedes that Emerson had command only of two or three meters; but he brings all the resources of his extraordinary critical acumen to prove that as a seer, as one who has intuition of the deeper truths of nature and the moral universe—in short, as a poet in the highest sense of the word—Emerson must take rank with the greatest geniuses of all time. In "Hydraulic Pressure in Wall Street," a writer who withholds his name, but who manifestly is no novice, exposes many of the tricks and devices by means of which fictitious values are created, and the unwary lured daily to ruin. Désire Charney contributes the eleventh article in the series on "The Ruins of Central America," and records the crowning triumph of his exploring expedition, namely, the discovery of a great ruined city in the hitherto unexplored country of the Lacandones, Guatemala. There are two papers on the civil service question: one, "The Things Which Remain," by Gail Hamilton, who labors to relieve the civil service from the aspersions cast upon it on account of Guiteau's crime; the other, "The Business of Office-Seeking," by Richard Grant White, who forcibly portrays the moral ills that come from the perennial struggle for place. Finally, Francis Marion Crawford, son of the eminent American sculptor, writes of "False Taste in Art," and indicates certain directions in which art-culture might be developed under the conditions of life existing in the United States. The *Review* is for sale by booksellers and newsdealers generally.

GENERAL INTELLIGENCE.

☞ *We solicit and are always pleased to publish in these columns any items of interest that may be furnished us.*

GAS AND WATER.

WORKS FOR HACKENSACK, N. J.—Rapid progress is being made toward the completion of the water-works for the above-mentioned city. The pumping station is located on the Hackensack River. The plant consists of two Worthington engines of 3,000,000 gallons capacity each. The water will be forced through 14 miles of 20-in. cast-iron pipe to a reservoir of 15,000,000 gallons capacity, located at Weehawken, the elevation being 180 ft. above high water. The consumption has been estimated at 3,000,000 gallons per day. C. B. Brush, of the firm of Spielmann & Brush, Civil Engineers, of Hoboken, is chief engineer, and John F. Ward contractor. The work will be finished by Nov. 1, 1882.

WATER CONTROVERSY AT NEWPORT, R. I.—A dispatch from Newport says: There was a hearing before Judge Carpenter this morning on the water question. George H. Norman, Lieutenant Governor Fay, L. D. Davis and ex-Mayor Slocum testified that more water was needed, while Colonel George E. Waring, Jr., was the only witness who certified that the water was impure and not fit to drink. The testimony of several witnesses was called in rebuttal to show that the water was pure, all the witnesses having resided on or near the pond which the city gave George H. Norman for the city's water supply, that gentleman having built the water-works. The real object of the fight is to prevent Norman from confiscating the land near the ponds, according to the provisions of the charter granted him. Later—Judge Carpenter decides in favor of Mr. Norman, who can now go ahead and take land for the use of the city water supply. Of course a board of arbitration will decide what damages he must pay. The decision gives great satisfaction.

SAN FRANCISCO WATER RATES.—From a local paper we clip the following: The Committee on Water and Water Supplies presented an order to the Board fixing the water rates. The order was based on the order introduced by Mr. Fisher, eliminating the provisions which the late decision of the Supreme Court holds to be unconstitutional. The new order differs from Mr. Fisher's order in providing for the payment of $7,000 a month by the city for water used for family purposes in the public buildings, and making a reduction to that extent in the rates to be paid by consumers. The order submitted provides for a payment of $84,000 per annum for water used for family purposes, and reduces the rates as presented in the Fisher order 7 per cent. The order also provides for a reduction of 17 per cent. from the rates as at present fixed by the Bayly order. The rates fixed by the order are as follows: For buildings occupied by a single family, covering a ground surface of from 600 to 700 square feet, one and two stories, $1.35; three stories, $1.50; four stories, $1.70; five stories, $1.85; 700 to 800 square feet, one story, $1.35; two, $1.50; three, $1.70; four, $1.85; 800 to 900 square feet, one story, $1.50; two, $1.70; three, $1.85; four, $2; five, $2.20; 900 to 1,000 square feet, one story, $1.60; two, $1.85; three, $2; four, $2.20; five, $2.35.

No single rate to be less than $1.35. For all houses one story in height, covering a greater area than 1,000 square feet, there shall be added 17 cents for each additional 200 square feet or fractional part thereof, and the further sum of 17 cents for each additional story; and where a house is occupied by more than one family three-quarters of the foregoing rates will be charged in addition. The order was referred to the Board as a Committee of the Whole.

MAY DISPOSE OF ITS GAS-WORKS.—The City Solicitor of Philadelphia has decided that there is nothing to prevent the sale or lease of the works.

THE GAS QUESTION.—Twenty-five years ago last night the Covington Gas Company contracted with the city of Newport to furnish them gas for twenty-five years, and their contract expired last night. A few weeks ago an arbitration committee was appointed to fix the value of the stock and fixtures of the Covington Company in Newport, which was to be purchased by the Newport Company. The arbitrators fixed the value at $82,900. Yesterday the representatives of both companies held a meeting in this city, and the Covington Gas Company tendered to the Newport Light Company a deed for all the pipes, meters, etc., and demanded in lieu thereof $82,900, as specified in the report of the arbitrators. The Newport Company refused to receive the deed; but said that they would take the mains, pipes, service-pipes, posts, meters, etc., and pay on account $31,555. The Covington Gas Company took the money on account, and both parties agreed that the reception of the money by the Covington Gas Company, and the reception of the mains, meters, etc., by the Newport Company, was not to prejudice the right of either company in future litigation. Suit will be brought by the Covington Company against the Newport Company for the remaining $51,000, which, of course, will be resisted by the Newport Company. The Newport Company claims that the gas-meter and grounds and exhauster were not to be included as fixtures. The Newport company were represented by Mr. John A. Williamson, Mr. Johnson and Judge O'Hara, and the Covington Company by Hon. John W. Stevenson, Hon. George H. Pendleton, Hon. John F. Fisk, Amor Shinkle, Esq., and Bradford Shinkle, Esq., while Andy Hickenlooper, Esq., of Cincinnati, was a silent spectator on the outside. The Covington Gas Company turned off their gas in this city yesterday, and at 8 o'clock last night the city was nearly in darkness, until the Newport company made their connections with the Cincinnati Company, which was done about 9 o'clock. The gas is not over brilliant. A special meeting of the City Council was held last night to ratify the contract with the Newport Company; but they postponed action until next Thursday night. Mr. J. C. Dreber has his gas-works completed, and the gas gives a light of 24-candle power. He will have his buildings lighted in full tonight, to give the public a chance to view his beautiful works by gaslight.—*Cincinnati Enquirer, June 9.*

LEAKY RESERVOIR IN PHILADELPHIA.—Complaints have been made for some time that, in consequence of the poor work upon the lining of the Wentz farm reservoir, in the Twenty-third ward, water has constantly leaked through and seriously damaged the adjoining farm lands. A suit has been brought against the city by a farmer named Peters to recover $20,000 damages for injuries he claims to have sustained to his crops and land by the constant dampness caused by the leaking of the public basin.—*Times.*

BURSTED RESERVOIR.—The east side of the Portland (Me.), reservoir gave way on June 9, and an immense torrent of water poured down Vaughan into other streets, tearing up pavements and curb stones and flooding cellars. In 30 minutes 6,000,000 gallons of water escaped. No one was injured. The damage is $5,000. The reservoir had recently been pronounced safe, but the water worked through first at the top, between the blue clay and stone parapet.

WATER-WORKS EXTENSION.—Work was commenced yesterday on the foundation for the new high-service engine at the water-works. Reference to the magnitude of the new water-works extension has been made on several previous occasions, but it will be more clearly understood when it is stated that the foundation alone will cost $90,000, and the building to be constructed upon it $250,000, and the engine to be placed in it about $14,000. The large cost incident to the foundation and building is occasioned by the massive stones and heavy iron to be used in the structure. The Water Commissioner is of the opinion that the new engine will arrive at St Louis about next October, and will immediately be placed in position.—*St. Louis Globe-Democrat.*

ADDITIONAL PUMPING MACHINERY.—One year ago the Dean Bros.' Steam Pump Works, of Indianapolis, furnished the water works at Edmore, Mich., with one of their steam pumps. They have just shipped another pump to the same place, which will double the supply. The water-works are owned by the village of Edmore.

ELECTRICITY.

LONG DISTANCE TELEPHONING.—European journals which have just come to hand print at length two complimentary dispatches sent simultaneously from Brussels to Paris. One of them was sent by telephone and the other by a Morse instrument over one wire at the same time. The invention by which this feat was made possible is that of M. Van Rysselberghe, director of the meteorological service of Belgium.—*Engineering and Mining Journal.*

RAILROAD TELEGRAPHING.—C. F. McGlashan, proprietor of the Santa Barbara (Cal.) *Press* has patented a system of railroad telegraphy for which he claims exceptional advantages. According to his circular the invention furnishes a practical method of establishing constant telegraphic communication between any number of moving railway trains and any number of stations. Ordinary telegraph wires, batteries and instruments are employed, and a regular telegraph office is placed upon each moving train. The principal feature is the use of two wires instead of one, in transmitting the electric current. Wheels or electric brushes attached to the moving train touch these wires, conveying the current from one wire to the instrument in the car, and returning it to the other wire, along which it passes until its destination is reached, when it is connected with a ground wire, and completes the circuit through the earth. The same current is made to pass through several trains by a simple method of switching at stations.

REGULATING WIRES UNDER AND ABOVE GROUND.—The committee on police and fire-alarm telegraph of Philadelphia reported in Select Council with a favorable recommendation the general ordinance to regulate the use of underground telegraph and electric light wires. One of the provisions is that the city shall have the use of one or more of the conduits for the police and fire alarm telegraph whenever she desires it free of any cost. Another provision is that after the passage of the ordinance any corporation, firm or individual owning or maintaining any lines for telegraphic, telephonic or electric lighting purposes overhead in the city shall be subject to all charges provided in the ordinance for underground wires.

ROUGH ON THE TELEPHONE.—A Cincinnati paper tells of Mme. Materna's introduction to the telephone as follows: "The telephone was another new thing. I called up Chris Ahrens and told him a lady wanted to talk with him, and the next minute they were at it. All about Germany and in German. Lord, how that telephone suffered! The paint fell off the wires, and some of those seven-cornered words nearly broke the box. When they got through the telephone fainted."

THE SOUTH AMERICAN TELEGRAPH.—On the 13th the Central and South American Telegraph Company announced that they expect to have their cable completely laid during this month and in operation soon. The cable between Payta and Saint Elena was finished in May. The land line across the Isthmus of Tehuantepec was completed a couple of days ago, and the extension to Galveston, Texas, a distance of 280 miles, was successfully laid.

STREETS, DRAINAGE, ETC.

TO BE REPAVED.—The Mayor and several prominent citizens of Springfield, Ill., recently visited Bloomington, to examine the street pavement of that city. Springfield having been incorporated under the general law, it now proposes to pave in a substantial manner the entire business portion either with cedar blocks or stone. An ordinance to that effect is now pending before the City Council.

STREET IMPROVEMENTS.—The Paterson (N. J.) Board of Aldermen, on Monday night, passed the tax ordinance by reaching a compromise, appropriating $40,000 for permanent street improvements, without stating what streets were to be improved. The first street paved will be Main street, and the pavement in Broadway, New York, will be taken as the model.

STREET DEPARTMENT OF SAN FRANCISCO.—Auditor Brickwedel has received the following estimates from Superintendent Graham for the Street Department's requirements for the fiscal year ending June 30, 1883: Street Fund—Labor on accepted streets, at $8,500 per month, $102,000; labor on sewers, $4,000 per month, $48,000; material, $120,000; street-sweeping, $54,000; rent of corporation yard and salary of keeper, $1,920; incidental repairs, $4,800; total from street fund, $330,720; salaries payable from general fund, $32,500; stationery from special fee fund, $800; repairs on county roads, $10,000.

RAILROADS.

A NEW RAILROAD IN MEXICO.—BOSTON, Mass., June 12.—A special to the *Advertiser*, from San Diego, Cal., says: "Another Boston railroad in Mexico, the 'Bee Line,' both ends of which are in the United States, is the last project practically begun. It begins at National City, three miles from here, at the present terminus of the California Southern Railroad, and runs southeast through Northern Mexico, 470 miles to Calabasas, in Arizona, running only twelve miles in the United States at the west end. Crossing lower California to the mouth of the Colorado River, thence across Northern Sonora and leaving it near the Eastern line, it enters Arizona and runs twenty-four miles to Calabasas, where it will connect with the Sonora Railroad from Guaymas, running northeast to a connection with the main line of the Atchison, Topeka & Santa Fé Railroad, at or near Benson, and will have an extension north from Calabasas to the main line of the Atlantic & Pacific Railroad by way of Prescott.

WORK IN THE SOUTHWEST.—NEW ORLEANS, June 15.—Four thousand tons of steel rails are now being discharged at College Point, sixty miles above this city, for the New Orleans & Mississippi Valley Railroad Company. The engineer corps is pushing forward in the direction of Baton Rouge through the sugar plantations on the banks of the Mississippi River, and tracklaying will soon begin.

THE MEXICAN CONGRESS.—The Congress of Mexico has authorised the executive to build a railroad across the Isthmus to Tehuantepec with government money; there was also authorized an extension of the time for the drainage of the Valley of Mexico.

THE CANNON VALLEY SURVEY.—The surveyors of the Cannon Valley Railroad have made a preliminary survey from Faribault to Northfield, Minn. The route surveyed is on the west side of Cannon River and about 300 ft. east of the Chicago, Milwaukee & St. Paul road. The surveyors have not decided which way they will survey from Northfield.

THE ST. CROIX & CHIPPEWA RIVER RAILROAD CO.—RIVER FALLS, Wis., June 9.—The St. Croix & Chippewa River Railroad company has been incorporated with a capital stock of $500,000. A charter has been obtained and the following officers elected: I. McGregor, president; J. D. Putnam, vice president; J. B. Thayer, secretary. The road is to be constructed between a point on Lake St. Croix near Catfish bar, by way of this village and a point on the Chippewa River near Duran, to connect with the Chippewa Valley & Superior road.

MILES OF LOADED CARS.—WINNIPEG, June 9.—There are thirteen miles of loaded cars standing on the tracks of the Canadian Pacific Railroad in Winnipeg, St. Boniface and other points between here and including St. Vincent. The local accommodation for removal is insufficient to meet the demand, and the Canadian Pacific have put on a force of 100 men to assist to unload. The freight shed is not only filled but the ground all around is covered with goods.

BONDS VOTED.—Wheeling, W. Va., has voted to subscribe for $20,000 of the stock of the Wheeling, Parkersburg & Charleston Railroad. The road will run from Wheeling to the mouth of the Kanawha.

THE TEXAS & PACIFIC.—MARSHALL, Tex., June 10.—The working forces of the Texas & Pacific car and machine shops here have been augmented recently, until the number now employed exceeds the forces engaged prior to the reduction. As several damaged cars and other jobs have been forwarded to St. Louis lately, on account of pressure of work at the Marshall shops, it is thought there will be a further increase here, that all such work may be done at home.

TEXAS NARROW GAUGE.—On the 10th connection was made between the tracks of Bremond's Houston, East & West Texas Railway and Col. Fred Grant's Texas Western, the rail being united at the new bridge just completed over Buffalo Bayou. Both are narrow-gauge roads.

LABOR ON A LOCOMOTIVE.—From the statistics of the locomotive industry it appears that it takes five men about one year to construct a locomotive at the present time. In 1835, the date at which the industry really assumed a standing in this country, at about which time the Baldwin Locomotive Works and the locomotive establishment at Paterson, N. J., commenced business, it took more than double that number of hands the space of eighteen months to make an engine. The difference in time and labor saved must be looked for in the improvement of the old machinery and the invention of new machinery and appliances.—*Mechanic.*

NEW LUMBER LINE.—A Milwaukee note says: President Rhinelander and General Manager Reed, of the Milwaukee, Lake Shore & Western road, left for Pelican, the northern terminus of the line, yesterday. They will look over the projected routes to the Wisconsin River rapids, from a point a few miles above Pelican, and will definitely decide upon the exact direction of the new line. It is the intention of the officials to engage large gangs of graders and tracklayers and rush the construction of the branch to completion before the middle of next August, in order to compete for the Northern fall lumber traffic.

A NEW ROAD.—Two corps of engineers left here last night for Springfield, Mo., to survey a road from Springfield to Harrison, Ark., a distance of one hundred miles. This road is being constructed by the St. Louis & San Francisco line, and will open a rich agricultural and mineral country in Central and Northern Arkansas. It will be pressed to completion as rapidly as the road can be graded. It is proposed to extend it to Yellville, Ark., and thence southeast to the interior of Arkansas. The road is built as a feeder to the 'Frisco line, and to draw the trade of Arkansas to St. Louis.—*St. Louis Exchange, June 8.*

THE Pittsburgh Southern Railroad has been sold to the Pittsburgh & Monongahela Valley Railroad.

A PENNSYLVANIA ROAD.—Work on the new Delaware Valley Railroad will begin in August if the right of way between Milford and Port Jervis can be secured by that time.

THE Canadian Pacific Railway is now graded for 150 miles west of Brandon, and ironed for 80 miles. Word has been received from the Barclay and Brereton survey parties that the former has completed correction of the survey of last year, and the line has now been definitely located further south. The new line will save ten miles of construction, besides being straighter and easier of operation. It will be more expensive to build, but there will be a saving in the end. The route as now located follows the line between townships 17 and 18, almost from the center of range 11, west of the second principal meridian to the east line of range 21, crossing Pile of Bones Creek, where the north line of township 17 intersects that line. The route is now fully fixed to Moose Jaw Creek with this correction. Brereton is now about locating the line from Moose Jaw to Strong Current Creek and ferry, and Shaw from there to the Rockies.

GETTING TO BE GIGANTIC.—The East Tennessee, Virginia & Georgia road will soon have its extension from Macon, via Atlanta, to Rome, Ga., completed. That portion of the extension from Macon to Atlanta will be completed by the 15th of July, while the Rome extension will be ready for use as early as the 1st of September. When these extensions are completed they will become formidable competitors with the Georgia Central and Western & Atlantic roads. The latter-named railroad is owned by the State, but operated under lease to private parties. For years it has been one of the best paying roads in the South, but its great monopoly will soon be at an end. The present lease has some seven or eight years yet to run, but at the expiration of that time it will be a difficult thing to lease it for anything like the sum now realized. It is believed that the State would now be willing to sell the road if anything like a reasonable offer was made. In view of the growing opposition, it is doubtful if any syndicate can be found that would care to purchase.

RAILROAD WORK.—Work on the Milwaukee & Lake Winnebago Railroad is being pushed forward as rapidly as possible. The route between Neenah and Oshkosh has been surveyed and staked out.

PROGRESS IN CANADA.—The surveyors are pushing forward work on the Quebec & Ontario Railway. They are now at work staking the proposed line near Doncaster, and are steadily working westward. Work on the first division, commencing at the Yorkville terminus, will be commenced shortly. The first division covers forty miles of the proposed road.

TUNNELS.

THE MONT BLANC TUNNEL.—Engineers are said to believe the proposed Mont Blanc tunnel to be impracticable. Dr. Stapf, of the St. Gothard work, is one of them. He has recently announced himself in accord with Herr Heins, a Swiss engineer, in pronouncing the work one of immense difficulty, since in one part it would need to be carried through a formation of anhydrous gypsum, which, on exposure to the air, expands beyond control. Herr Heins says, in addition, the minimum temperature of the galleries would be 98° Fahr.

CONTRACTS LET.

SCHOOL-HOUSE CONTRACT LET.—The Committee of City Property, of Holyoke, Mass., has awarded the contract for the construction of the ward 7 school-house to James Dougherty for $13,990. There were five bids, Mr. Dougherty's being the lowest. The committee rejected the bids for the excavating as too high, and will have the work done by the city teams and men, who will begin at once. The award is $700 less than the architect's estimates. The contract calls for the completion of the building within five months.

RAILROAD CONTRACTS LET.—The contracts for clearing and grubbing 75 miles of the Ottawa & Gatineau Valley Railway, from Hull to Desert, have been awarded. Messrs. Grace and Fitzgerald take the upper half, and Messrs. Bainbridge (Pickanock) and T. F. Delaney (Napanee) the lower half. Work is to be commenced at once, and to be completed by the 1st of September.

PUMPING ENGINE CONTRACT LET.—The St. Louis office of Henry R. Worthington (F. H. Pond, representative) have contracted to furnish the pumping machinery for the Hot Springs (Ark.) Water-Works, consisting of two pumping engines, having a combined capacity of 1,500,000 gallons per day, together with the boilers, etc.

The contract to build the combination bridge, two spans, 110 ft. each, stone piers, at Hamburg, Ia., was awarded to S. M. Hewett, of that place.

The contract to build the iron bridge at Anamosa, Ia., two spans, 112 feet each, stone piers, was awarded to King Bridge Co., of Des Moines, Ia.

The contract to build an iron bridge, 112 ft., stone piers, at Savannah, Mo., was awarded to W. J. Hobson.

BRIDGE CONTRACT LET.—Proposals were opened June 15, for the construction of the superstructure of an iron bridge on Chapel street over West River, at New Haven, Conn., with the following result:

Clarke Bridge Company, Baltimore, Md	$11,053.00
King Iron Bridge Company, Cleveland, Ohio	9,150.00
L. W. Densmore, Hillsboro Centre, N. H.	9,066.00
Wallis Iron Works, Jersey City, N. J.	8,945.00
Whitbeck & Power, Hudson, N. Y.	8,848.00
Wrought Iron Bridge Company, Canton, Ohio	8,569.00
D. H. Andrews, Boston, Mass	8,150.00
C. V. Pendleton, Norwich, Conn	7,844.00
Morse Bridge Company, Youngstown, Ohio	7,500.00
Corrugated Metal Company, East Berlin, Conn.	6,990.00

The contract was awarded to the Corrugated Metal Company. Proposals for the substructure will soon be called for.

MILWAUKEE CONTRACT LET.—The following contracts were awarded by the Board of Public Works, yesterday: Laying pipe sewer in Walnut street from Nineteenth to Twentieth street, to Robert Chambers at $1.69 per lineal foot; to the same contractor for laying a pipe sewer in Beaubian street from Eleventh to Twelfth street at $1.54 per foot; for paving Galena street from Third to Seventh streets, William Forrestal, at $1.23 per square yard; for curbing in the same street, V. Kuhlman, at 56¼ cents per lineal foot; for planking the sidewalk, H. Vogt, at 38 cents per foot; for sodding, M. Shea, at 12 cents per square yard.

CAR WHEEL CONTRACT LET.—The Chicago, Milwaukee & St. Paul Railway Company has completed a contract with the Allen Paper Car Wheel Company, of New York, for a supply of wheels for all its parlor, sleeping and dining-room coaches. It is the intention to introduce these wheels generally upon the road outside of freight cars.

BUILDING CONTRACT LET.—The committee on works of the Trustees of the Gas Works met in the Gas Office yesterday to receive proposals for furnishing the material and building the alterations of the coal storehouse and wall around the tank yard, 600 feet in length. Samuel Hart was the successful bidder, at $8,300.—*Philadelphia Times, June 13.*

BUILDINGS.

PLANS FOR COUNTY BUILDINGS.—WASHINGTON, C.H., O., June 10.—The Commissioners adopted the plan of Gibbs & Co., architects, of Toledo, O., for the new court-house and jail in this county. The court-house will cost $85,000 and the jail $15,000.

BUILDING IN THIS CITY.—José F. Navarro transmitted to the Building Bureau plans for eight new fireproof flat houses, which he proposes to build on Fifty-eighth and Fifty-ninth streets, near Seventh avenue. The flats are to be nine stories high, with a total frontage of 420 ft. and 200 ft. in depth, with court-yards. The materials are to be brick and stone, with slate and brick roofing. The estimated cost is $200,000 each.

COURT-HOUSE AT LOS ANGELES, CAL.—The County Board of Supervisors have voted to sell the present court house and devote the proceeds toward building a new one.

BRIDGES.

WILL BUILD A BRIDGE.—Duxbury, Mass., will build a stone bridge over Blue Fish River. The building committee consists of John S. Loring, Bradford Weston and Andrew Northey.

BIDS FOR ERECTING A BRIDGE AT SALISBURY.—NEWBURYPORT, Mass., June 12.—The County Commissioners have opened the bids for the mason work of Deer Island Bridge, in Salisbury, which varied from $84,000, the lowest (by Ross & Blaisdell, of Ipswich,) to the highest, $127,000 (by J. A. Greeley, of Newburyport).

NEW IRON BRIDGE.—Work commences next week on an $1,800 new iron bridge just east of Tekonsha, Mich.

MISCELLANEOUS.

CONGRESSIONAL NOTE.—Mr. Beach introduced a bill granting permission to three men, therein named, to dig for treasure and minerals on the government lands at West Point, one-quarter of the treasure found to belong to the government; also a bill authorizing the construction of a bridge across the Hudson River between Storm King and Breakneck mountains.

RESUMED WORK.—The iron mills in Cincinnati, Newport, Covington and Aurora have all resumed operations.